April 30, 1923

McGraw-Hill Co., Inc.

25 cents per copy

# CHEMICAL & METALLURGICAL ENGINEERING

RECEIVED
JUN 2[illegible] 1923
LIBRARY
CHEMISTS' CLUB

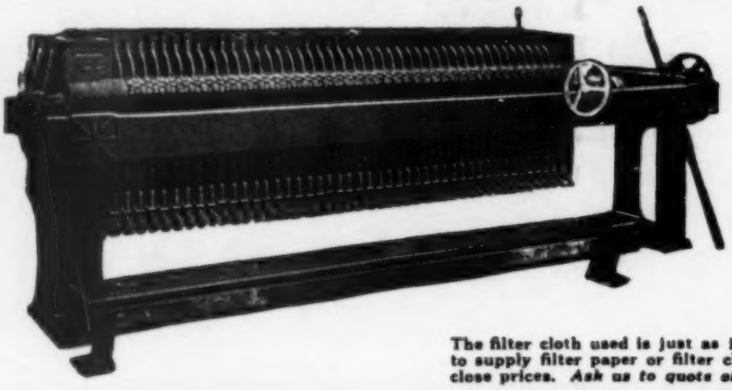

## Control the Heat - and

*Get Uniform Products of High Quality*

**Asphalt –**
**Chemical –**
**Vegetable Oil –**
*and many other Industries find*

**"Merrill Process of Oil Heating"**
**indispensable in the making of Quality Products**

**Parks - Cramer Company**
*Engineers & Contractors*
*Industrial Piping and Air Conditioning*
1102 Old South Building, Boston, Mass.
*Represented in England and on the Continent by The Kestner Evaporator & Engineering Co., Ltd. London, England*



## Shriver Efficiency

Many years of producing filter presses for all types of filtration work enable us to guarantee the results.

This guarantee of efficiency goes with every filter press we sell—we know our product, and we are ready to stand back of it. Write for catalog, stating your filtration problems.

**T. SHRIVER & CO.**

808 Hamilton Street, Harrison, N. J.

The filter cloth used is just as important as the filter press. We are in a position to supply filter paper or filter cloth especially woven for filter press work, at very close prices. *Ask us to quote on your filter cloth requirements.*

"Proctor"

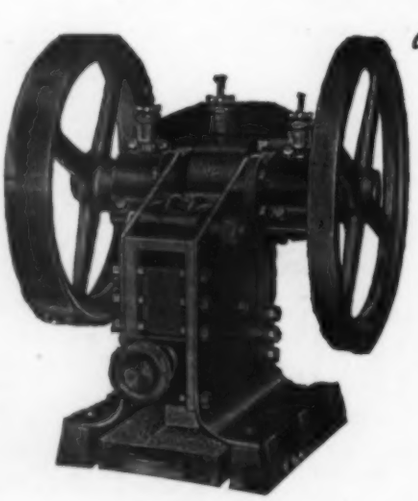
# DRYING MACHINERY

PROCTOR & SCHWARTZ, INC.

PHILADELPHIA

# Braun Crushers, Grinders, Furnaces, Gasoline Burners

*and other forms of laboratory apparatus*



Braun Crushers

We are Eastern Agents for the widely used Braun Apparatus.

The different sizes of the Chipmunk Crusher are the most satisfactory for crushing rock and coal down to 20 mesh.

The Braun Disc Pulverizer is intended to be used with a crusher to reduce to 100 or 200 mesh.

The coal grinders are used especially to prepare coal specimens for calorimetric tests.

The furnaces are muffle, crucible and combination for heating by gasoline or gas.

Burners are supplied for gasoline or gas, also for kerosene, with suitable tanks and blowers.

*Write for Catalog pages stating your requirements*

# EIMER & AMEND

ESTABLISHED 1851

*Headquarters for Laboratory Apparatus and Chemicals*

200 East 19th St., New York City, N. Y.

WASHINGTON, D. C.—*Display Room*
Suite 601, Evening Star Bldg.

PITTSBURGH, PA.
4048 Jenkins Arcade

# CHEMICAL & METALLURGICAL ENGINEERING

*A consolidation of*
ELECTROCHEMICAL & METALLURGICAL INDUSTRY *and* IRON & STEEL MAGAZINE
H. C. PARMELEE, Editor

Volume 28 — New York, April 30, 1923 — *Number* 17


## George K. Burgess, Director Bureau of Standards

OUR industries will welcome the appointment of GEORGE K. BURGESS as director of the United States Bureau of Standards. To them this will be a well-deserved recognition of a man who has long been associated with fundamental problems in the metallurgical field, to which he has made contributions of great importance. These industries will, to be sure, regret that they must share so eminent an investigator with other industries, for, as a result of his appointment to the directorship, Dr. BURGESS will doubtless find it necessary to turn over to others many of the important metallurgical investigations he has so ably directed. But the promotion to the directorship is so eminently fitting and so well deserved that all will rejoice in his selection.

Any position of as great importance as the directorship of the Bureau of Standards is a matter of deep concern to the industries; all want to know what policy will be followed. In this case there is no cause for apprehension, for the new director has been associated with the bureau for 20 years and has been largely responsible for the development of some of its most successful work and policies. Industry can therefore feel full confidence in the continuation and enlargement of the service this institution has so splendidly given to all branches of business.

In this appointment, too, there is a recognition of the importance of fundamental research. The work done by the Division of Metallurgy under Dr. BURGESS' direction has invariably been of the type that industry welcomes. It has been planned only after conference with industrial representatives in order that it will be of maximum usefulness to industry. Yet it has always been guided by the thought that the bureau should deal with fundamentals and not with those problems of industrial research that can be managed quite as well or even better in industrial laboratories or by consulting engineers. Some of the other sections of the bureau have not been so fortunate in their plans and other branches of industry may have had some feeling that the bureau has unduly encroached upon the field of industry. It will perhaps be impossible to correct all such cases immediately, but we can look forward with confidence to the new director's judgment and his unswerving devotion to the general good. He first of all is a good scientist, but secondly is a man of sound business judgment, admired and liked by all who know him.

*Chem. & Met.*, speaking for the industries it serves, welcomes Dr. BURGESS to his new position and assures him of unstinted co-operation and support in his new and larger responsibilities.

## Selling Short On Arsenic

A REPRESENTATIVE of the Chamber of Commerce of the United States, speaking before the American Paper and Pulp Association, has emphasized the important service problems of a trade association. He emphasizes two important aspects of such association work that are particularly essential to successful progress of any trade body. The first relates to defensive efforts and the second to constructive effort for the advancement of the industry as a whole.

There is little need to discuss both the desirability and the propriety of joint action for defensive purposes in opposing unreasonable legislation or unjust practices of those within or without an industry. The chemical industries will recognize the importance of these problems, for they have been all too conspicuous recently in tariff legislation, in the regulation of industrial alcohol and in similar federal, state and municipal affairs. But there is too little emphasis placed upon the more constructive efforts of trade associations.

Representatives of the chemical industries were called together almost 2 years ago by the Department of Commerce in the hope that some satisfactory basis of co-operation might be arranged for rendering to the industry, to the government, and to the public at large, adequate statistical service. This was a constructive effort from which much was hoped, but due to the opposition of certain individuals, or the companies which they represented, the several plans proposed did not prove to be acceptable and very little progress has been made, especially in the field of heavy chemicals.

At the time the original proposals were made, it was argued that the industry would gain quite as much as the public from this statistical service, but some rather shortsighted companies failed to appreciate this point. Now we have a most conspicuous example in the arsenic situation of this erroneous view.

It seems to be well established that certain makers of calcium arsenate have contracted for deliveries which they are not in a position to make without additional purchases of white arsenic. And this is one commodity that certainly is not readily available at a reasonable price, if it be available at all. This unfortunate result might have been avoided if these companies had been advised of the current stocks, sales and production of arsenic. As it now stands, some are bold enough to forecast large losses for these manufacturers before they are able to gather together from limited supplies the necessary arsenic to complete deliveries under the contracts to which they are committed.

It would be an unusual example of the irony of fate

if it should prove that some of those companies that have opposed Secretary HOOVER'S statistical work for the chemical industry should be the very ones to suffer these losses. We sincerely hope that the rumor of losses has been greatly exaggerated and that some satisfactory commercial solution will be found. But whatever may be the outcome of this particular shortage, no one can deny that it is a convincing and conspicuous demonstration of the necessity of more regular, prompt and accurate statistics for the chemical industry compiled either by the government or by some appropriate trade association.

## The Chemistry-Commerce Course At the University of Wisconsin

OUR news pages, in this issue, contain an announcement of a new course at the University of Wisconsin. The course is a courageous and progressive experiment. It is to be called the "Chemistry-Commerce Course," and is designed to give the student both a fundamental knowledge of chemistry and an acquaintance with business procedure and economics. The conception of this course is that it will train men to become purchasing agents, salesmen and executives in the chemical industry, with enough chemistry to deal intelligently with the technical problems as they come up, and yet be essentially business men.

Naturally, the graduate of such a course will not be a competent chemist and it will be incumbent on the educators in charge to make sure that these graduates understand this limitation. On the other hand, there is no doubt that the industry will benefit greatly by the induction of such men into the non-technical positions, for a sympathetic grasp of technical problems is something that is greatly needed.

There is still another phase of the question. There is no doubt that the technical man in industry, at the present time, is ill equipped for other than technical work. This is substantially proved by the very large number of men who are mired in operating routine and who will never rise above it. It is, of course, quite impossible in a 4-year technical course to take up business training as well. Yet it does seem as though the student could be given some conception of the necessity of such training, so that he might familiarize himself with it after he has completed his technical course. The technically trained man who had, in addition to his engineering, a thorough grounding in business would be superior in ability and background to the graduate of this Chemistry-Commerce Course. Yet, this new course will turn out men better equipped to deal with the problems of industry and better equipped to become executives than the technical man of today.

Therefore it is our pleasure to congratulate the department of chemistry of the University of Wisconsin, from which this new course emanates, upon the really progressive idea. It will be our prediction that graduates of this course will find themselves well equipped to fill prominent positions in chemical manufacturing industries. But it will be our mission and effort more strenuously than ever to urge upon the *technical* man the necessity of acquainting himself with the commercial and business side of industry. The two efforts go more or less hand in hand, for one can hardly doubt that future chemists and chemical engineers studying at the University of Wisconsin will have their attention more definitely focussed on business subjects simply because of the existence of this Chemistry-Commerce Course. The chances are that their curriculum may be too full to undertake such studies, but many will supply the lack that has been made apparent to them after they have completed their technical course. Therefore it will have a twofold benefit, both direct and indirect, and it remains to be seen which will be of the greater significance.

## Dean's Law of Increasing Returns

WE CONFESS to leanings mathematical. Only when we got as far as differential equations did our interest lag, for then the methods appeared to become empirical, solutions were discovered by a happy chance, rather than by the logical progression of ideas. But these differentials were bread and butter to our professor in thermodynamics, who appeared to be able to start with two simple laws—he said they were simple—and prove anything in the heavens above, the earth beneath or the waters under the earth. Especially the Second Law appealed to him. He would hold it up before our wondering eyes as did the serpent the apple in the Garden of Eden. It almost sprouted a third law, which, however, we were assured was somewhat apocryphal. And then there was the principle of LE CHATELIER—"clearly comprehended in the Second Law." Wonderful; astounding; stupefying!

That principle of LE CHATELIER really is a strange thing. Our lecture notes record that "no proof, in the ordinary sense, can be given of it; it is a generalization based on experience." (Thus it is much like many beliefs, religious and spiritual, and can readily be accepted by the lay reader.) It states that every system in equilibrium tends to remain unchanged. In other words, a balanced system remains balanced. So simple it sounds foolish!

Like $\frac{dx^2}{d^2y}$, it doesn't mean much until some particular examples are cited. Suppose a certain volume of gas is compressed; its temperature forthwith increases. Q.E.D. (Figure it out for yourself.) But the mysterious and amazing part of it is that the law holds for the workings of an entire manufacturing process. And that's what we started to talk about.

During the war when potash was precious, a good friend, J. G. DEAN, was showing the Southwestern Portland Cement Co. how to make expenses from potash and sell cement as an incidental byproduct. He revised their burner settings, adjusted the zone of maximum temperature and the rate of charging so as to volatilize the maximum amount of potash from the slurry. With an eye single on potash, he found that a greater tonnage of clinker was produced, it was better burned, and yielded a sounder cement. "Come to think of it," said DEAN, "I was not so surprised as the manager. I have found that whatever you do which really improves the quality of cement will recompense you doubly—it also increases output and decreases cost."

This idea has almost been enshrined as "Dean's Law." It fits in closely with LE CHATELIER'S—and in turn is solidly founded on the ultimate authority of the second law of thermodynamics. What more could be asked? We can phrase the law in many ways, but it comes down to this: That money wisely put into a process is always returned; or that the way to do a thing best will always be found to be cheapest.

JOHN J. COYLE once showed us an electric furnace near Pittsburgh. At first it operated quite intermittently, it produced about 6,000 lb. of steel a turn, of

which 55 per cent eventually was marketed as A1 bars. After devising ways and means to operate continuously, the life of the furnace roof was increased 150 per cent; production rose to 10,000 lb. per turn, and 70 per cent of it was sound! The best way is evidently the cheapest.

You will probably remember that an enormous amount of smoke litigation has been launched against Western smelters under the belief that the solid fume in smelter smoke was damaging land, crops and live stock. Large dust chambers were forthwith constructed to settle the fume. In order to drag the gases through, more draft was needed, and the easiest way to get this was to build a higher chimney. Higher chimneys in turn gave more draft at the furnaces, which enabled the operators to build hotter fires (still more draft!), bigger furnaces and far greater output per ton of coal and per furnace. Isn't this another manifestation of Dean's law?

A last citation from the automobile industry: H. T. CHANDLER, when studying some unsatisfactory drop forgings, discovered that failure was usually located by kinked "flow lines" in the macrostructure. On redesigning the dies, solely to smooth out the flow lines, he found that the new forgings were far more reliable, and strangely enough (or was it strange?), the life of the dies had increased from 3,000 to 10,000 pieces.

There is no one way of doing things right. The way constantly shifts as circumstances change. But the right way will always be found to be an economical way. If the practice is continually revised so that the product approaches perfection, the results will return the expense and then some. This is Dean's law.

## An Amazing Opportunity —Just Missed

A CORRESPONDENT has sent us a clipping from the New York *American* of April 8, 1923, which announces the vacancy in a post as chemist in the Department of Health of New York City. The requirements are that the applicant be a citizen of the United States, and that he be able to analyze accurately all food products, to detect and identify coal-tar dyes, preservatives, metallic and alkaloidal poisons, to conduct research ("perform research work" the announcement reads) in connection with the analysis of foods, and to qualify in court as an expert when prosecutions are brought for food-law violations. The candidate must have a degree from a college of recognized standing "or a certificate from such institution that the applicant has pursued for 2 years a course of study tending to qualify him for the position." The salary is $1,244 a year. Following this is the cheerful statement that "other vacancies at higher salaries occur from time to time." Now, $1,244 a year means almost $23.85 a week. Resolved into mills, it is about a million and a quarter per annum.

Alas and alack, applications closed at 4 p.m. on April 18 and we cannot tell the good news to the world in time to be of service. But there is hope for other vacancies! We should think these would occur frequently, even at the "higher salaries," because men with families are likely to starve out fast enough to provide plenty of places. Plenty of "opportunities."

A few years ago the chemists of this department joined a union under the auspices of the American Federation of Labor. We criticised such preparations to strike as unprofessional conduct. We still hold to the opinion, but we appreciate the fact that a salary of $23.85 a week might wither the sense of professional obligation in a chemist who had prepared himself to meet the requirements.

All this merely shows the confusion that is bound to follow dunderheaded ignorance in administration. No field of this world's work is more democratic than the field of science; but the theory that one man is as good as another will not work in chemistry. To expect a trained man of science to work efficiently for less than a hod-carrier's pay may be sound according to present-day Russian philosophy, but it doesn't fit in the United States. It accords with the theory of Dictatorship by the Proletariat, but it does not accord with the encouragement of education.

## Sir Joseph Conquers

TO THE student of physical science the name of Sir J. J. THOMSON will always be one with which to conjure. His experimental wizardry has been both the inspiration and the despair of his followers. And so, for those who had the good fortune to hear his address at the dedication of the Sterling Chemistry Laboratory in New Haven, it was a rare treat to come into contact with his personality.

Just what Sir JOSEPH thought is another matter. Probably the enthusiasm of a thousand listeners does gratify no matter how inured to it one may be. Usually it is apparent from a speaker's general attitude that he is enjoying himself or that he isn't, that he likes his auditors or that he is out of sympathy with them, that he is instructing them or making fun of them. Sir JOSEPH'S auditors came away puzzled. On the whole he seemed to like us, but he could not help chiding us as Americans for not appreciating WILLARD GIBBS, whereas British scientists conferred on GIBBS their highest honor. Parenthetically it may be remarked that this appreciation, though sincere, was entirely academic; furthermore, the honor of really discovering WILLARD GIBBS must still rest with the great Hollander ROOZEBOOM.

Later on Sir JOSEPH gently admonished the chemists because of their lack of facility with mathematics, although it was all done with the air of a kindly and somewhat lenient parent. Throughout his all too short talk the progress in physical research was recorded in such an impersonal way that an uninformed auditor might easily have thought that the distinct pioneer and recognized leader was only a well-informed historian. Never an "I" crossed his lips.

Still another glimpse showed him to be somewhat gleefully group-satisfied because the physicist had bested the chemist in isolating and measuring the units of matter. In that connection his figure of speech is worthy of repetition, although naturally we make no effort to defend it: "Assuming that the chemist's test for a penny is no more sensitive than his test for a single molecule, the chemist would not be able to tell whether a man who possessed a million million dollars and had changed it all into pennies was really a millionaire or a pauper, so crude are even his most delicate methods of detection." Yet in almost the same breath Sir JOSEPH wondered whether physical chemistry should not really be called chemical physics, so closely do the two fields merge.

These are but a few random impressions of a great scientist, who has come to our shores, has seen our universities and scientific organizations, and has conquered our respect and admiration.

# Readers' Views and Comments

***An Open Forum for Subscribers***

The editors invite discussion of articles and editorials in *Chem. & Met.* or on other topics of pertinent interest

## Lime and Colloid Chemistry

*To the Editor of Chemical & Metallurgical Engineering*

SIR:—The want of complete knowledge in regard to lime was emphasized by Oliver Bowles in the issue of March 7, the article being supplemented by an editorial query, "What Causes the Variations in Lime?"

Having been engaged on colloid research, particularly in regard to the successful removal of combined sulphur from vulcanized rubber, by the addition of a substitute adsorption medium composed of an emulsoid colloid solution, it occurred to me that the problem in regard to lime could be solved by methods peculiar to colloid chemistry.

A lime from Shenandoah Valley, Va., was found to be too "short," as the plasterers termed it, when used as a finishing coat; it would not spread easily, the particles would not slide and roll under the plasterer's trowel, but seemed to hang back, as if they possessed the sharp edges of the calcite in a highly crystalline and pure limestone. Particles of lime, if crystalline, would tend to retain their form, even after calcining and hydration.

In "Applied Colloid Chemistry," Bancroft gives some interesting examples of adsorption of solid by solid. To apply this idea, we took ordinary hydrated lime, about 60 mesh, and by adding various powdered substances (covered by patent application) of about 200 mesh, a product resulted from which it was possible to make a plaster which, when dry, was firm and hard, tough and elastic. This was improved by adding another fine powder of an organic nature, as I realized that something of this kind would be present in small quantity in sea water when the lime was deposited.

The question then arose as to whether it would be possible to coat the sharp edges of unburned crystalline lime particles in the same manner. This was done. The ground waste from the Veruga marble quarry of San Diego County, Calif., which is a highly crystalline limestone and contains 97½ per cent $CaCO_3$, was ground in a Hardinge mill with a few finely powdered substances, which cost about $1.50 per ton; the product was 97 per cent lime of a quality which was equal, it is believed, to that which is being sold, according to Mr. Bowles, for $200 per ton.

To the prepared limestone is added water in sufficient quantity and in the same manner as one would with hydrated lime. It takes from 24 to 36 hours to dry, and forms a plaster that is superior to the best on the market. This adheres to planed wood, to oily, corrugated or other kind of paper; it will not crack or check.

Rooms have been plastered with the composition, which has also been applied as a rough coat with sand, in the proportion of 5 of sand to 1 of the composition. The composition plaster was then used as a finished lime, making an unusually hard and firm coat. It becomes so hard when dry that it can be polished with an agate burnisher. The composition plaster was also applied to boards outdoors in California; it has remained unaffected by 2 months' winter rains.

It seems proper to answer your editorial question, "What causes variations in lime?" by explaining that these are due to the variations in the elements present in the sea water when the deposition or sedimentation of the lime occurred. Research on lime must be carried on with recent advances in colloid chemistry in mind.

C. F. WILLARD.

San Diego, Calif.

## Winged Errors In Chemical Literature

*To the Editor of Chemical & Metallurgical Engineering*

SIR:—Your Homeric phrase in the Feb. 21 issue, just received, ἐπεα πτερόεντα, reminds me of the case of silver alum, so useful in chemical philosophy according to the old periodic law in representing silver as like to the alkali metals. Some years ago, when the late Vernon Harcourt was Lees reader, some workers in the Christ Church laboratory attempted to make this in the textbook manner by using strong sulphuric acid in a sealed tube. When the attempt had failed Harcourt remembered that the discoverer had corrected his mistake within a few months of the announcement at a meeting of the chemical society at which he (Harcourt) had been present. The alum was formed from alkali in the glass of the tube. In chemistry the acceptance of observations as true may depend more on the prejudice of authority rather than on evidence.

E. F. MORRIS.

Manchester, England.

## Magnesia as A Polishing Agent

*To the Editor of Chemical & Metallurgical Engineering*

SIR:—In reference to your article on "Magnesia as a Polishing Agent," page 441, March 7, 1923, and the letter of E. H. Dix in your issue of March 28 I am in a position to confirm the fact that Dr. Walter Rosenhain was the first to use such materials for polishing metals, and more specifically aluminum alloys.

I distinctly recall preparing both alumina and magnesia powders by elutriation for polishing purposes as far back as 1901, at which time I was Dr. Rosenhain's assistant. These materials were used for polishing aluminum alloys.

C. J. BROCKBANK.

Buffalo, N. Y.

## Sponge Iron by New Method

Successful production of sponge iron on a commercial scale has been achieved in a direct-fired rotary kiln at Silver City, Utah. This is the outcome of extended experimentation on the part of metallurgists in the employ of the Interior Department. The furnace was that of the Tintic Milling Co.

If cheaper sponge iron can be obtained, it is believed that it will find large use as a precipitant for copper.

# George K. Burgess, Director, Bureau of Standards

MANY friends of Dr. Burgess are congratulating him on his appointment as director of the Bureau of Standards, made by President Harding, April 23. Ever since the resignation of Dr. Stratton—who became president of Massachusetts Institute of Technology on Jan. 1—Secretary Hoover has been considering the qualifications of several men who might be available for the post.

A proper selection is no mean task. From the point of view of the manufacturing industries, the directorship of the Bureau of Standards is the most important technical position in the government service. The director must understand their problems and plan broad investigations that will shed the most light on manufacturing difficulties. On the other hand, he must be a successful leader of men whose life work is scientific research of the utmost accuracy and precision. Beyond all this he must be able to administer the affairs of a series of great laboratories, having a budget of 1¾ million dollars annually.

That the choice finally rested upon Dr. Burgess is therefore of far more significance than a mere promotion on the staff. It is a recognition of the fact that the erstwhile chief of the Metallurgical Division is a man highly regarded by the men in industry, a leader among his fellow scientists, and an administrator of ability. The choice is a happy one. It cannot help but react favorably upon the bureau's esprit de corps, as a well won recognition of proved merit.

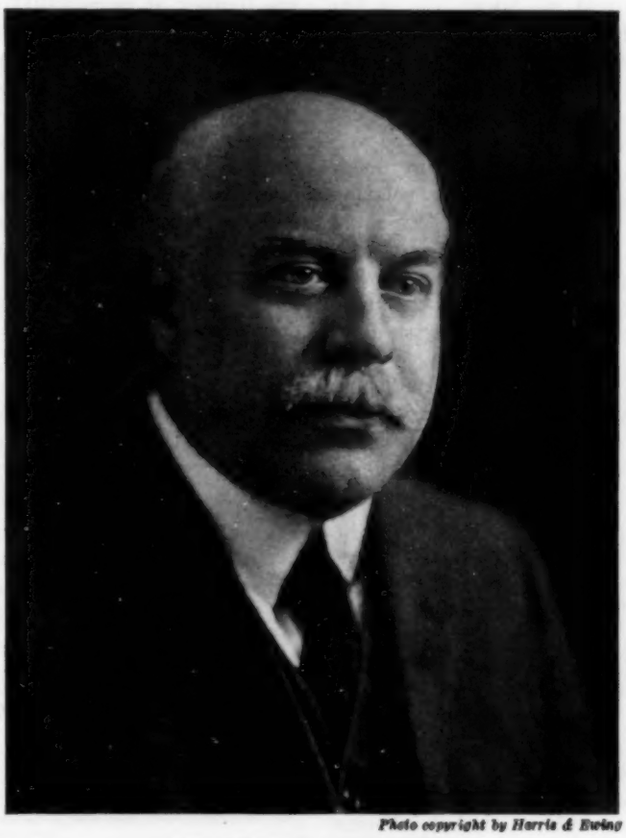


*Photo copyright by Harris & Ewing*

DR. GEORGE K. BURGESS

It is hardly necessary to say much about Dr. Burgess to our readers. They have often seen him in action at various society and committee meetings—indeed, his appetite for travel and variety of work seems insatiable. He has been with the bureau for 20 years, and during half that time has been directing the Metallurgical Division. As befits that position, he entered largely into the work of the American Society for Testing Materials, serving on committees and directing many investigations into the properties of commercial metal. These activities the society has recognized by making him its president, a position he now holds.

Dr. Burgess is also very much interested in the Iron and Steel Division and the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers. The young American Society for Steel Treating has also enlisted his support. At home, he is active in various committees on the National Research Council, American Physical Society, Washington Academy of Science and the Philosophical Society of Washington (of which he is past president). Abroad, he is a member of the British Institute of Metals and the Société de Physique.

Descended from Puritan ancestry, he was born at Newton, Mass., Jan. 4, 1874. He studied at Boston Tech. (S.B., 1896) and in Paris (D.Sc., 1901). He taught physics at Tech., Michigan and California from 1896 to 1903; in the latter year he entered government service. On Jan. 5, 1901, he married Mlle. Suzanne Babut.

Dr. Burgess' acquaintance with the French language has borne fruit in the translation of Duheim's "Thermodynamics and Chemistry," and the publication of "Reserches sur la Constante de Gravitation." His best known book is the translation of Le Chatelier's classic on "Measurement of High Temperature"; indeed a later edition, enlarged and modernized by the translator, has become the standard English work on pyrometry. Temperature measurement is not included in the Metallurgical Division at the bureau—nevertheless Dr. Burgess has never permitted his interest in pyrometry to lag, nor missed a timely opportunity to emphasize the necessity of accurate heat control to modern metallurgical operations.

His contributions to the learned and professional societies and technical press are too numerous to list here. Several important monographs and professional papers from his pen have been printed by the Bureau of Standards. Beyond this, many similar publications by members of his staff undoubtedly owe their inception to Dr. Burgess, and their successful conclusion to his encouragement and seasoned advice.

His early publications naturally are concerned with methods of measuring very high temperatures. This requires a knowledge of the amount of energy radiated from a hot body, and the development of instruments to measure this radiation. Dr. Burgess bent his energies to these two great problems, and in conjunction with Messrs. Waidner, Waltenburg and Foote, issued a number of publications containing many essential data. With Messrs. Crowe and Scott he did some extraordinary work on the nature of the so-called magnetic transformation $A_2$ in pure iron. That his mind does not run along strictly academic and scientific lines may be inferred from his publications on open-hearth practice, sound ingots, and on rail manufacture. Recently he has acted as chairman of the joint committee investigating the effect of sulphur and phosphorus in steel.

# What Must a Corporation Do To Borrow Money From a Bank?

**A Brief Survey of the Procedure Followed in an Average Bank When a Prospective Borrower Is Investigated as a Credit Risk—What Does the Banker Want to Know and How Does He Go About It?**

BY CHARLES WADSWORTH, 3D.
Assistant Editor of *Chemical & Metallurgical Engineering*

IN THE first article on this subject, an interview with William Post,[1] the field of operation of the commercial banker was defined. Mr. Post pointed out that the commercial banker must confine himself to liquid business. He must not tie up his depositors' money in either long-term loans or in permanent improvements, so called "fixed assets."

So, with the field defined, an analysis is in order that we may better understand the banker's relation to industrial or commercial organizations. We must study the inside workings of the machinery for granting bank credit, which means, in other words, what must you do to borrow money. Perhaps the best procedure would be to go through the process with John Smith & Co.

Before we go with Mr. Smith to the bank it will help considerably to understand two points of view. The first point is to recall that a banker is in a sense a trustee for his depositors. They intrust their money to him. It is payable on demand, and therefore a certain percentage of the deposits must be retained by the bank for such needs. The other point of view is that the banker is anxious to make reliable loans, since that is the way he makes a profit for the bank. He is a salesman with a peculiar commodity to sell. His customers often must be solicited and sold, much as those of any salesman; yet he can never lose sight of the fact that he is a trustee. This interesting dualism is frequently not recognized. Even many bankers, because of a consistent demand for bank credit, forget that they are half salesmen and adopt toward industry an attitude of self-conscious benevolence that is irksome and unjustified. Throughout the discussion you will find many points at which these two selves of the banker would be antagonistic in their desires and in some cases an obvious convention has been created to solve the problem.

## How to Select a Bank of Deposit

To return to Mr. Smith and his bank, it is first of all essential that he should have exercised considerable care in the selection of a bank. A bank is not just a bank, but it has what might be termed a personality that depends upon the policies of its directors and executives. A bank should be large enough to take care of the expanding needs of a business and yet not so large that the client's business would come to be handled in a routine manner. These limitations are not obvious ones and a business may be embarrassed if either condition arises.

Beyond the question of actual size is the question of the temper or personality of the bank. Do they handle business similar to that of Smith & Co.? Are they familiar with the credit requirements of the business and are they well disposed toward and sympathetic with that type of credit risk? Perhaps a disproportionate percentage of the bank's clientèle is in the same field. This might not be desirable, either. These questions are of less consequence to the large corporation borrowing from many banks and regarded as a good client, but they vitally concern the smaller unit. The bank of deposit is of unusual significance, because loans are supposedly confined solely to the bank's depositors. This is frequently stated as an ironclad rule, although there is an easy way out the side door which may be shown concretely as follows: It is a convention that 20 per cent of the loan shall be left as deposit in the bank (a convention not universally prac-

### The Client's Shorter Catechism

CAPITAL

Authorized ..... Subscribed ..... Paid in .....

Held by Company as Treasury Stock .....

How Paid in: Cash $ ..... Other Property .....

Description of other property and how valued .....

Incorporated in what State and under what General Law or Special Act .....

Date of Charter ..... Commenced Business .....

Are Stockholders liable beyond amount of stock subscribed? .....

Regular times of balancing books .....

Regular times of taking inventory .....

Give basis of statement, whether actual inventory, by whom taken and date, or if estimate, by whom made and date. .....

What amount, if any, of Acct's and Bills Rec. are past due, extended or renewed? .....

State last date of taking trial balance, and if same proved .....

Do your plans for your fiscal year contemplate anything in the way of building operations, plant extension or investment in other fixed assets: If so, please state amount to be so invested .....

We believe the maximum aggregate amount which we shall borrow on short credit or sale of paper the current year will not exceed $ ..... and we hereby agree to obtain this Bank's consent before borrowing in excess of that amount.

(Please sign here) .....

By .....

Date signed ..... 191

STATE OF .....
COUNTY OF ..... ss

..... being duly sworn deposes and says that he is the ..... of .....

that he signed the foregoing statement for and in behalf of said .....

that the said statement to the best of his knowledge is true in substance and in fact.

Subscribed and sworn to before me this ..... day of ..... A. D. 191

.....
Notary Public.

My commission expires .....

[1] See *Chem. & Met.*, vol. 28, No. 11, p. 487, March 14, 1923.

ticed, but nevertheless in wide observance). Thus a borrower would automatically become a depositor if he were not one already. But to return to our previous point, it can be said that in general a bank loans to its depositors and thus the bank of deposit will be in a position to exercise an important and occasionally a vital veto on the financial resources of an industrial organization. That is why the bank of deposit must be selected with care.

### Don't Play Ostrich With the Bank

With this background let us go with our friend Smith to negotiate a loan, his first, with his bank of deposit. If Smith is wise, he will lay all his cards on the table. More than anything else this predisposes the banker in his favor. Complete and frank answers to necessarily searching questions will often swing a borderline decision in his favor. It is a frequently occurring experience of the banker to see a marked resentment on the part of a prospective borrower at the "unreasonable inquisitiveness" of the bank's inquiry. Very frequently, too, this resentment is due to the fact that all is not wholesome with the borrower and he does not want to reveal a weakness.

The first set of questions that the banker asks are those that deal with the nature of the business. This is frequently embodied in a notaried statement, a sample of which is given herewith. The questions are largely self-explanatory, but several points are worth noting. For example, there is a widespread misconception that treasury stock is the same as authorized but unissued stock. The unscrupulous promoter is responsible for this point of view. Treasury stock is actually fully paid stock bought in by the corporation. Again, the method of evaluating property is important, as considerable water can be pumped into a financial statement by overvaluation of property. This point will doubtless be the subject of some investigation by the banker. He may not be vitally interested in the actual figure but rather in the spirit of the estimate. Frequently it would be very difficult to determine the true value of real estate, for example, as this might depend on a possible purchaser in the event of sale or on an estimate of increased value, which would always be precarious.

In addition to the above questions it is desirable to know the executive personnel and that of the board of directors as well as the amounts of their individual financial interest in the venture.

All of the foregoing might be classed as preliminary investigation. Following this the banker will ask Mr. Smith to fill out a form which will be discussed later and will then commence an investigation of John Smith & Co. from the outside.

### Why the Banker Does Not Know the Depositor

It may cause some surprise to realize that a banker knows as little about his depositors as would be inferred from the foregoing and following discussion. However, it is none the less a fact that, granting exceptions, he does not. It is a physical impossibility in the first place and in the second place, as one banker said, a bank will take a deposit from anyone, but lending its money to someone is a very different thing. In other words, so long as a depositor keeps out of the red, he needs little attention. In fact a firm may keep a large deposit in the bank and unless it writes checks of large denomination that have to be O.K.'d by an officer of the bank, the bank may know nothing of the deposit. Thus it comes about that a large depositor of some years' standing may ask for a loan and be amazed at the complete ignorance which the bank has with respect to its affairs.

### Investigating a Credit Risk From the Outside

Of course the first step in the outside investigation of a client is a study of the agency rating in both Bradstreet's and Dun's. This gives very little idea of anything except the order of magnitude of the business. Only a very approximate idea of the client as a credit risk can be obtained. Then follows a widespread inquiry through the bank's business connections and associates as to the character of John Smith & Co. Suppose they manufacture hardware. The people from whom they buy steel, machinery and supplies will tell the bank whether they discount their bills or whether they are slow pay. These trade estimates from firms of known reputation, together with the reports from banks that know the firm, are the most important forces in molding the banker's opinion of a credit risk.

As William Post pointed out about 15 years ago, credit reliability is based on character, capacity, capital and collateral. It is significant that character is placed first, capacity second and capital third. All information on character is obtained from outside sources, as is much of the information on capacity. The latter is also inferred from the consecutive financial statements, but it is primarily on these outside estimates that the banker will rely. From another angle it will be seen that it is logical for the banker to depend on them. They show exactly how the firm behaves in practice. It is not theory or deduction. "As a man or firm does, so he is," at least so far as the banker is concerned.

Perhaps the greatest banking genius in our generation, the late J. P. Morgan, said that he would lend some men a million on their word whereas he would not lend others 5 cents on government bonds. You cannot get data on the reliability of a man's word (which includes character and capacity) from statistics. You can and do get it from banks, business associates, from the companies with which he deals. That is the *quod erat demonstrandum*.

In addition to those sources already mentioned there is the splendid machinery of the National Association of Credit Men. Its interchange bureaus give accurate information and are invaluable in aiding bankers to obtain information on so-called foreign paper—that is, commercial paper offered for sale originating in other communities. Although this is perhaps the most useful part of the interchange bureau's work, the commercial banker does use it often to confirm opinions on local corporations and individuals.

### Investigating a Credit Risk From the Inside

Let us consider now the form which John Smith & Co. must fill out for the banker. Each bank has a standard form to fill out—one for individuals or partnerships and one for corporations. Herewith is reproduced a facsimile of a typical form for corporations. A somewhat detailed comment is in order, though the financial statements will not be analyzed until a later article.

The first page contains, of course, the formal application for credit, and under it the two most important sets of data—the balance sheet and profit and loss

# Type of Statement to Be Filled Out by Corporation Applying for Credit

Business.....Address.....

Name (Corporate style under charter).....Laws of state of.....

For the purpose of procuring credit from time to time from you for our negotiable paper or otherwise, we furnish you with the following statement and information which fully and truly sets forth our financial condition on the.....day of.....19.....which you can consider as continuing to be full and accurate unless notice of change is given you. We agree to notify you promptly of any change that materially reduces our pecuniary responsibility.

In consideration of the granting of such credit, we agree that if we at any time stop payment or become insolvent, or commit an act of bankruptcy, or if any of the representations made below prove to be untrue, or if we fail to notify you of any material change as above agreed, or if we assign any accounts or transfer or encumber any of our assets in such way as, in your opinion, to materially affect our business or financial condition, or if execution be issued on any judgment obtained against us, then all our obligations held by you shall immediately become due and payable without demand or notice, and the same may be charged against the balance of any deposit account kept by us with you, we hereby giving a continuing lien upon such balance or deposit given from time to time existing to secure all our obligations held by you.

| ASSETS | | LIABILITIES | |
|---|---|---|---|
| Cash on hand | | Notes payable to Nat. Bk | |
| Cash in National Bank | | " " to other banks | |
| Cash in other banks | | " " for paper sold through brokers | |
| Due from customers: | | " " for merchandise | |
| On notes receivable (good) | | " " to others | |
| On open accounts (good) | | Accounts payable for merchandise purchased | |
| Due from controlled or allied concerns: | | " " to others | |
| For merchandise sold | | Due to officers, directors, employees, and stockholders | |
| For advances made | | Deposits of money with company | |
| Due from officers, directors, employees, and stockholders | | Accrued expenses | |
| Merchandise: | | Mortgage debt | |
| Finished (how valued) | | When due | |
| In process (how valued) | | Bonded debt | |
| Raw (how valued) | | When due | |
| Land and buildings (see other side), mortgages if any, in liabilities | | Interest rate | |
| Mchy. & equip. (present value, mortgages, if any, in liabilities) | | Lien on what assets | |
| Furniture and fixtures | | Other liabilities (itemize) | |
| Stores, supplies, etc. | | | |
| Deferred charges | | | |
| Investment in controlled or allied concerns | | | |
| U. S. Government securities | | Reserves (itemize) | |
| Other bonds, stocks, and investments | | | |
| Good will | | | |
| Patents | | | |
| Other assets (itemize) | | Capital stock, preferred | |
| | | " " common | |
| | | Surplus | |
| TOTAL | | TOTAL | |

## PROFIT AND LOSS ACCOUNT

| | | | | |
|---|---|---|---|---|
| Total net sales for year, less returns | | | | |
| Net trading profit (after all expenses) including interest $ | | | | |
| Other income $ | | | | |
| Total income | | | | |
| Dividends: | | | | |
| Amount paid | | | | |
| Rate on preferred Rate on common | | | | |
| Amount declared (not yet paid) | | | | |
| Deductions (itemize): | | | | |
| Amount carried to surplus | | | | |

| Depository Banks & References | Amount Credit Extended | Amount Owing Above Date |
|---|---|---|
| | | |
| | | |

## CONTINGENT LIABILITIES

Were you contingently liable on statement date:.....

| | Amount |
|---|---|
| 1. For customers' papers discounted? | $ |
| 2. For accommodation Indorsement or Guarantee | $ |
| 3. For unused balances of Letters of Credit? | $ |
| 4. Under contracts for merchandise purchased for future delivery (How do such contract prices compare with present market)? | $ |

Losses by bad debts.....

Amount of assets pledged as collateral for money borrowed or otherwise.....

.....Are all accounts and bills receivable for merchandise sales?.....

Amount of insurance carried on 1. merchandise.....2. machinery and fixtures..... 3. bldg.....Do you exchange paper or indorse for anybody?.....Amount of notes and accounts receivable past due.....Is there any suit or litigation pending against you?

.....Have you an interest in any other firm or corporation?.....

State location of such concern and nature and extent of interest in it.....

.....

Do you place commercial paper through brokers (name)?.....

Are your books audited by a Certified Public Accountant?.....

PLEASE GIVE FULL DETAILS BELOW, SPECIFYING AMOUNT OF FIRST, SECOND OR OTHER MORTGAGES—DESCRIPTION OF REAL ESTATE

| Location | Description of Property | Yearly Rents | Value | Mtg's | Due & Rate | Held By | Net Equity |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

Date submitted....., 19..

Have you had any serious losses through bad debts or otherwise between date of this inventory and present time .....If so please itemize.....

.....

Signed.....

per.....

account. These two topics will be elaborated in a later article. What we are trying to do now is to get a general impression of the kind of information which the banker seeks. Below the financial statement, the client is asked to list his depository banks and the amount of credit extended by each. Such information can, of course, be easily checked, and if any attempt is made to conceal other loans it will show up in a discrepancy between cash reported in the balance sheet and the amount accounted for on the books of the bank itself.

### Contingent Liabilities a Bad Sign

At the top of the reverse sheet the contingent liabilities must be listed. The existence of contingent liabilities is a most unhealthy sign from the banker's standpoint. This is easy to understand, since contingent liabilities may tie up assets as effectively as current liabilities. The term is somewhat elastic and frequently item 4, "materials purchased for future delivery," is not included. Usually the term applies to items 1 and 2. Accommodation indorsements are particularly obnoxious to the banker, for there is no way of evaluating the risk involved. In fact this item is sometimes estimated in with current liabilities in analyzing the statement.

There follows a series of questions all of which have a distinct bearing on the desirability of the credit risk. Losses by bad debts, for example, should be a relatively small percentage of the total sales. If it is higher than usual, the credit department of the company is not on the job. What portion of the assets listed in the balance sheet have been pledged as collateral. A $10,000 house with a $6,000 mortgage is not a good credit risk. Neither is a mortgaged business, whether its fixed assets are pledged for a bond issue or its receivables discounted for cash. Insurance is obviously important, for the bank cannot gamble that there will not be a fire within 90 days to impair the company's credit.

"Do you exchange paper or indorse for anybody?" Contingent liabilities again! They may not be on the books now, but day after tomorrow maybe they will. As to the next question, overdue accounts mean potential bad debts, a further check on the credit department.

"Are you in any other business?" asks the banker and with cause. John Smith & Co. may be liquid, even molten, but Jones & Brown may be on the verge of insolvency, and if John Smith & Co. have a large interest in Jones & Brown it is obvious that they are going to be much less well off than they are now. At any rate it is a wise thing for the bank to know the whole story.

Yet again Smith may have been giving his commercial paper to a broker to sell and if so the bank would like to know what broker. This will give him an additional line on the client. Commercial paper, by the way, usually refers to the promissory notes which a firm sells in the open market.

The final question, except for a listing of real estate is, "Have the books been audited by a certified public accountant?" There are two kinds of audits; the one is a simple certification that the arithmetic of the financial statement is correct and the other, based on a thorough inventory analysis and a complete study of the accounting system, means much more.

This covers in a general way the kind of information that a bank demands from prospective borrowers. I have attempted to give the various items a proper perspective in the general plan. In a subsequent article a study and analysis of the financial statements will be undertaken. Then credit can be discussed in terms of mathematics, but one must never lose sight of the fact that it is not either primarily or essentially a mathematical problem.

## Some Notes on Talc

The Bureau of Mines reports that the United States is at present producing approximately two-thirds of the world's supply of talc, a mineral the uses of which are many and varied.

The widest use of talc is in the powdered form. The value of ground talc depends upon color (whiteness), uniformity, fineness of grain, freedom from grit, "slip" and sometimes freedom from lime. White talc, free from grit and iron and low in lime, ground to about 200 mesh, is used largely as a filler for paper, rubber and paint. Ground talc and soapstone are used for foundry facings, either alone or mixed with graphite. A coarser grade of talc is used in the manufacture of asphalt-coated roofing felts and paper, both as a filler and as a surfacing.

The highest grade of ground talc is used as toilet powder, whiteness, fineness of grain, freedom from grit and lime and a good "slip" being essential. Ground talc is also used in dressing and coating cloth, in making soap, rope, twine, pipe-covering compounds, heavy lubricants and polishes. Massive varieties of talc, pyrophyllite and high grades of soapstone are cut into slate pencils and steel-workers' crayons. French chalk or tailors' chalk is a soft, massive variety of talc. In China, Japan and India, massive talc is carved into grotesque images and other forms and is often sold as imitation jade.

Talc is a hydrous magnesium silicate; it is often called steatite, soapstone or potstone, and by the trade names talc clay, agalite, asbestine and verdolite. The term talc may be used to include all forms of the pure mineral, whereas steatite denotes particularly the massive, compact variety, and soapstone the impure, massive form that often contains only 50 per cent of talc. Talc ranges in color from pure white and silvery white through gray, green, apple green, gray green to dark green, also yellow, brown or reddish when impure.

As talc is a relatively low-priced commodity and its distribution throughout the world is general, the location of new plants has been materially influenced by transportation and distance from markets. Most of the paper mills in the United States are in New York and New England, and the talc deposits of New York and Vermont have therefore been most fully developed, as they can easily compete with imported English clay. There are also important deposits in California, Washington, North Carolina and Georgia.

## The Search for Potash

In the search for potash supplies within the United States, the State of Utah seems to be the favorite hunting ground for mineral prospectors. Of 237 prospecting permits for potash issued up to March 1 by the Department of the Interior, 184 were in Utah. Twenty-five permits for potash prospecting in Nevada, 14 in California, 8 in New Mexico, 3 in Arizona and 1 each in Colorado, Montana and Nebraska had been issued. Technical supervision over potash mining operations is intrusted to the Bureau of Mines.

# Anti-Dimming Preparations for Glass Surfaces

By H. A. Kuhn

First Lieut., C.W.S., U.S.A., Edgewood Arsenal, Edgewood, Md.

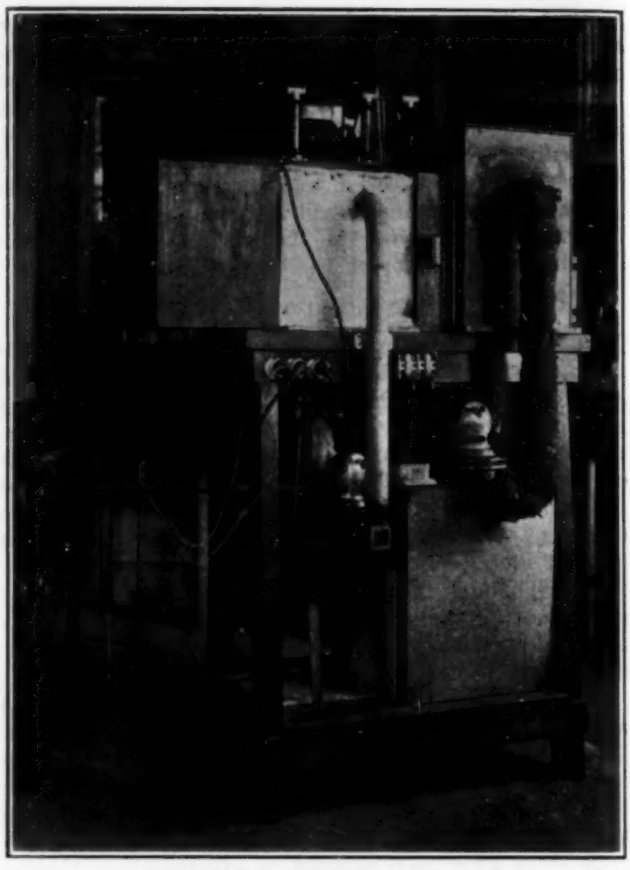
During the World War considerable research work was conducted by the Chemical Warfare Service on anti-dimming preparations for gas mask eyepieces. The essentials laid down for these anti-dimming preparations were: That they lower the surface tension of the droplets of water condensing on the eyepieces, causing them to spread into a thin film; that the preparation, spread to a thin film on the eyepiece, should be optically clear when dry, and that the film of material should not dissolve too rapidly.

An anti-dimming preparation satisfying these requirements was finally developed and adopted as the official anti-dimming material. This consisted essentially of sulphonated castor oil, sodium hydroxide, water glass and paraffin oil. Over eight million sticks, each containing about 25 grams of this material, were manufactured by various soap companies for the army during the war.

The base of this anti-dim was castor oil, which, owing to its use as a lubricant for airplane motors, was scarce and expensive. When the Chemical Research Division of the Chemical Warfare Service was reorganized in 1920, one of the problems taken up was the development of a material that would be as good as or better than the official anti-dim and that would not require castor oil as an ingredient. In addition, this new anti-dim was to be impregnated in a cloth in order to simplify the gas mask equipment. Considerable fundamental work along this line was done in the latter part of 1918 and several substitutes were suggested.

As a result of previous investigations, it was decided that an anti-dimming preparation made from sulphonated fat should be the proper mode of attack. Work was conducted along this line, using as a base rapeseed oil, cottonseed oil, corn oil, castor oil, coconut oil, peanut oil, raw linseed oil, cod oil and fish oil. Preparations were made using the sodium salt of the sulphonated oil with varying excesses of caustics and various binders, emulsifiers and restrainers to prevent drying of the preparation.

Previous investigators had developed various rapid tests for eliminating poor preparations. Several of these were based on the measurement of the lowering of the surface tension of water droplets, permitting them to spread to a film. The measurement of the spread of a drop of water, dropping a certain distance to a glass plate treated with the preparation to be tested, is typical of this type of test. Other investigators marked out squares on the laboratory windows, and by blowing steam against the treated windows and reading a chart placed some distance outside the windows, were able to secure a rough comparison between the anti-dimming power of various preparations. Other tests were carried out by testing the preparations on the eyepieces of the gas masks in use. All of these tests were limited in speed and accuracy.



ANTI-DIM TESTING MACHINE

To obtain more reliable comparisons the apparatus shown by the accompanying diagram and photograph was developed to test anti-dimming preparations under conditions simulating the most rigid field conditions. With this apparatus, conditions could be controlled, the factors varied, and tests readily duplicated.

The machine for testing the anti-dimming compounds consists essentially of three parts: A chamber into which a current of warm, humid air is blown; a chamber containing cold air; and between these a revolving disk of rubber with perforations over which is clamped a 3-in. glass lens on which the anti-dim is to be tested. The disk is so placed that one side of the lens is exposed to the warm moist air while the other side is exposed to the cooler air. The back of the warm air chamber is made of frosted glass, while the front is covered by the disk holding the glass lenses. The cool air chamber is open at both ends so that a light placed behind the frosted glass plate at the back of the warm

TYPICAL COMPARISON OF ANTI-DIM COMPOUNDS

Note: In this test all the preparations except the Official A. D. were applied to the lenses with impregnated cloth.

| | | | | | | | | Condition of Lenses | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time in Minutes | Hot Air Temp., Wet Bulb, Deg. C. | Hot Air Temp., Dry Bulb, Deg. C. | Relative Humidity of Hot Air, Per Cent | Cold Air Temp., Wet Bulb, Deg. C. | Cold Air Temp., Dry Bulb, Deg. C. | Relative Humidity of Cold Air, Per Cent | Difference in Temp. Between Hot and Cold Air | No. 1 Rape Oil Soap | No. 2 Rape Oil Soap | No. 3 Rape Oil Soap | No. 4 Cottonseed Oil Soap | No. 5 Official A. D. Soapstick | No. 6 Rape Oil Soap | No. 7 Official A. D. Soapstick |
| Start | 82.2 | 82.2 | 100 | 17.8 | 20.0 | 80 | 62.2 | | | | | | | |
| 10 | 86.7 | 86.7 | 100 | 23.3 | 25.6 | 83 | 61.1 | clr | clr | clr | clr | fogd | clr | fogd |
| 20 | 87.8 | 87.8 | 100 | 24.4 | 26.7 | 83 | 61.1 | clr | clr | clr | SF | fogd | clr | fogd |
| 30 | 87.2 | 87.2 | 100 | 25.6 | 27.8 | 84 | 59.4 | clr | clr | SF | SF | fogd | clr | fogd |
| 40 | 87.2 | 87.2 | 100 | 25.6 | 27.8 | 84 | 59.4 | clr | clr | SF | SF | fogd | clr | fogd |
| Average | 86.2 | 86.2 | 100 | 23.34 | 25.58 | 82.8 | 60.62 | | | | | | | |

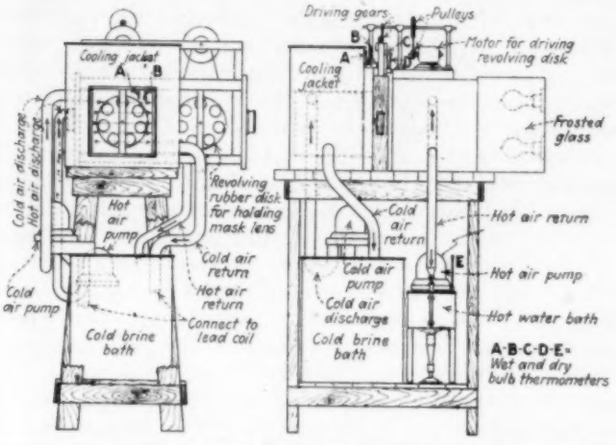
Result:
No. 1 Rapeseed: Clear throughout test.
No. 2 Rapeseed: Slightly fogged after 20 minutes.
No. 3 Rapeseed: Clear throughout test.
No. 4 Cottonseed: Slightly fogged after 10 minutes.
No. 5 Official A.D. Became cloudy after 2 minutes—fogged and covered with drops of water at end of test.
No. 6 Rapeseed: Clear throughout test.
No. 7 Official A.D. Became cloudy after 2 minutes—fogged and covered with drops of water at end of test.

air chamber can be seen through the lenses in the disk from the front of the cold air chamber. In this way the clearness of the lenses could be observed throughout the experiment.

As a result of a series of tests conducted in this manner, two anti-dimming preparations consisting of the sodium salt or either sulphonated rapeseed or cottonseed oil, sodium hydroxide, glycerine, sodium silicate and engine oil "F" were finally selected as superior to all others tested. Both of these proved superior to the sulphonated castor oil preparation used during the [illegible].

A typical comparative test of several sulphonated rapeseed oil preparations, the best cottonseed oil preparation and the official anti-dim stick under unusually severe conditions is given in the tabulation.

A preparation consisting of the sodium salt of sulphonated rape oil with an excess of sodium hydroxide and a small amount of sodium silicate, glycerine and engine oil "F" was selected for final tests. The material was applied in both stick form and impregnated in a loosely knit cotton cloth. It was found that for most




SIDE OF TESTING MACHINE, SHOWING HOT AND COLD AIR CIRCULATING PUMP AND MOTOR FOR REVOLVING DISK

purposes the cloth gave a more even and permanent film.

After tests on gas masks in use under field conditions the preparation was tried on the windshields of automobiles. A shield remained practically clear after running through a dense fog for 30 minutes. One application of the material was tested by driving through a fog for about 30 minutes. Several days later it still proved effective during a light rain.

The Navy Department has tested the preparation on the pilot houses, port holes and glass bridge screens of cruisers during rains and against sea spray. It was found that the windows remained clear during the rain, although it was necessary to renew the application after each rain. When under full speed the pilot house and bridge screens are continually dashed by salt spray. Although the anti-dim at first increased visibility, the thin film of salt water dried by the sun left a deposit of salt, which after a time considerably decreased visibility through the windows and necessitated their being washed. Tests are being carried out on the lenses of range finders and other optical instruments which must be kept clear at all times. To date the tests have been very satisfactory in so far as the elimination of drops of water is concerned. Further, there has been no evidence of scratching or other injurious effects on the lens. Preliminary tests on submarine periscope lenses have been so satisfactory that 150 sticks of 100 grams each were made and will be distributed to the submarines for further tests. In its tests, the navy has used both the preparation in sticks and those impregnated on cloth. The stick form has been selected owing to the small amount of material in the cloth as compared to the large surfaces to be treated.

## Improved Glass for Industrial Goggles

### New Glass of Special Composition Will Stand Much Greater Impact Than Ordinary Laminated or Hardened Lenses

AT PRESENT there are two common types of goggle glass. The first is composed of two layers of glass with a film of celluloid or similar material between. The strength of the glass is not improved, but the laminated structure retards penetration of a missile after the glass is broken. However, the thickness of the double lens and the color of the celluloid reduces the light transmission of the glass, and this is objectionable.

The second method is to use the ordinary glass and harden it by a sudden uniform cooling which introduces a uniform strain. This makes it very tough. This treatment actually increases the resistance of the glass to impact or stress and has been used in the manufacture of lamp chimneys, high-pressure gage tubes and industrial goggles.

#### Tests on Improved Glass

The Bausch & Lomb Optical Co. has now developed a new glass of special composition and improved physical properties which, when properly treated, will stand much more than the ordinary laminated or hardened glass. Lenses for industrial goggles made from this special glass have stood 125 and more blows on each side from a steel ball 1.59 cm. ($\frac{5}{8}$ in.) in diameter dropped from a height of 54 cm. (21 in.). A glass which will stand ten blows on one side is considered to be satisfactory by the Bureau of Standards.

In making a comparative test, the Bureau of Standards found its regular test was not severe enough. A summary of the bureau's results is given in the accompanying table. Steel balls 1 and $1\frac{3}{8}$ in. in diameter were dropped from increasing heights on the same side.

STRENGTH TESTS OF GOGGLE LENSES

| Kind of Lens | Diameter Of Ball, In. | Height, In. | Average Impact, Ft.-Lb. |
|---|---|---|---|
| Laminated | 1 | 14.5 | 0.18 |
| Regular or hardened | 1 | 13 to 21.5 | 0.16 to 0.26 |
| Special goggle: | | | |
| Group 1 | 1 and $1\frac{3}{8}$ | 36 to 96 | 1.36 |
| Group 2 | 1 and $1\frac{3}{8}$ | 36 to 96 | 1.30 |
| Group 3 | $1\frac{3}{8}$ | 96 and not broken | 2.95 |

Groups 1 and 2 of the special goggle lenses were finished in a way which reduced their possible strength. In group 1 three lenses out of a group of 17 were not broken under a blow of 2.95 ft.-lb., while in group 2 one lens was not broken with this maximum blow. Group 3 shows what strength may be developed by proper handling. Only one lens was broken under an impact of 2.95 ft.-lb. which was delivered by a $1\frac{3}{8}$-in. steel ball falling 8 ft. This is at least ten times the blow the ordinary goggle glasses will stand.

# Production of Hydrogen By the Thermal Decomposition of Oil

**The First of Three Articles Describing Exhaustive Experiments in Producing the Pure Gas Required by Governmental Air Services—Design, Construction and Operation of Modified Water-Gas Plant and Its Accessories**

By E. R. Weaver
Chemist, Bureau of Standards

THE experiments described in this article and those that will follow it were made for the purpose of determining the practicability of making hydrogen of sufficiently high purity for use in airships by the thermal decomposition of a hydrocarbon oil. The experiments were financed jointly by the Air Services of the army and the navy and were carried out at the plant of the Gas Engineering Co., of Trenton, N. J., with an existing water-gas plant which was suitably modified for the purpose of the experiments.

The method employed was essentially that of the Berlin Anhaltische Maschinenbau Aktien-Gesellschaft[1] and the good results reported by Leslie Vicroy, of the Goodyear Tire & Rubber Co., who experimented with the method during the summer of 1920, were the immediate incentive to a more complete study of the method.

## General Principles of Process

This method of manufacturing hydrogen by the thermal decomposition of oil is very simple in principle. Essentially it consists merely in vaporizing a hydrocarbon oil and passing the vapors over surfaces sufficiently hot completely to decompose the hydrocarbon into its elements. The simplest way of accomplishing this, and the method employed in most of the experiments here described, is to blow air through a bed of coke, burning the resulting "blast gas" in a tower filled with checker brick, which will usually be called the vaporizer. When both coke and brick have reached the desired temperature, oil is run onto the heated brick, and the vapors pass through the column of brick and thence through the hot coke. The carbon deposited in both chambers is burned out during the next "blow" and provides a part of the fuel necessary for maintaining the required temperature.

The reactions involved in the process are almost independent of the nature of the hydrocarbon used. If any hydrocarbon is heated to a sufficiently high temperature it breaks down into simpler substances, eventually yielding hydrogen and carbon. During the decomposition methane is always produced, and it is this compound which is most difficult to decompose. The equilibrium between methane and hydrogen in contact with carbon can be represented by a curve of the general character shown in Fig. 1.

Unfortunately methane does not decompose to any considerable extent in the gas phase. This is shown by the non-luminous character of the methane flame. It is stated by Bone and Coward[2] that the decomposition of methane is a surface phenomenon exclusively, even at temperatures as high as 1,500 deg. C. Decomposition and separation of carbon take place throughout the mass of almost any other hydrocarbon, but these observers found that the carbon of methane would separate only by deposition upon a solid surface. Even under favorable conditions the rate of decomposition of methane is extremely slow. J. N. Privy[3] found it necessary to heat 22 hours at 1,200 deg. C. to approach equilibrium, and 2 hours at 1,500 deg. C. It is obviously impossible to make hydrogen commercially and to allow it hours of contact with heating surfaces. The time of contact must be reduced to a few seconds and this means that the temperature must be several hundred degrees above the equilibrium temperature corresponding to the gas composition desired. If the decomposition of methane is exclusively a reaction between solid and gas phases, its rate should be directly proportional to the area of the solid surface. The elimination of methane from hydrogen produced upon a commercial scale therefore depends upon decomposing the oil in contact with a very large surface at a very high tem-

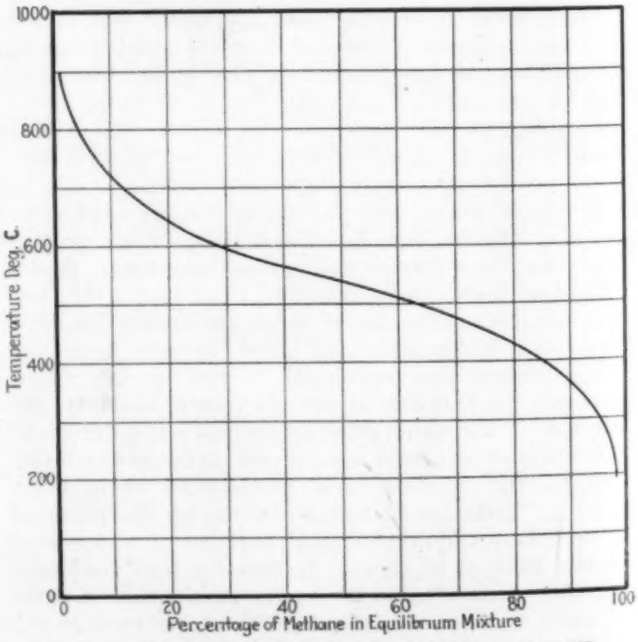



FIG. 1—EQUILIBRIUM IN REACTION, $CH_4 = C + 2H_2$

---

Published by permission of the Director of the Bureau of Standards of the United States Department of Commerce.

[1] British Patent 2054 (1914). Similar processes have been proposed by several inventors; of these the Rincker-Wolter process is the best known. For a review of these methods, see "Industrial Hydrogen," by H. S. Taylor, the Chemical Catalog Co.; or "Hydrogenation of Oils," 2d Ed., by Carleton Ellis, D. Van Nostrand Co.

[2] *J. Chem. Soc.*, Vol. 93, p. 1197.

[3] *J. Chem. Soc.*, Vol. 97, pp. 498-511.

perature; but of the three factors—temperature, surface and time of contact—temperature is by far the most important.

The excessive temperature required is the source of most of the difficulties encountered in the practical application of the method, and leads at once to something of a dilemma. On the one hand, about the only solid available at a reasonable price which will stand the necessary temperature without crumbling, sintering or taking part in undesirable reactions with oxygen, hydrogen or carbon is carbon itself. On the other hand, carbon is the one substance that might be used which it is difficult to heat to a high temperature. An inert refractory is easily heated by an oil or gas flame to a temperature of 1,600 to 2,000 deg. C. What happens in the case of carbon can be readily seen by considering a bed of coke heated by an air blast.

No matter whether carbon burns first to carbon monoxide or to carbon dioxide, the reaction between carbon monoxide and oxygen is so much more rapid than the reaction between oxygen and solid carbon that carbon dioxide is the only gas formed in large quantity so long as an appreciable amount of oxygen is present. At temperatures above 1,000 deg. C., however, the carbon dioxide reacts very rapidly and practically completely with carbon to form carbon monoxide again. The amount of heat produced in burning carbon to carbon monoxide is sufficient to raise the temperature of the products of combustion to only about 1,400 deg. C. if no heat losses occur, while the heat liberated

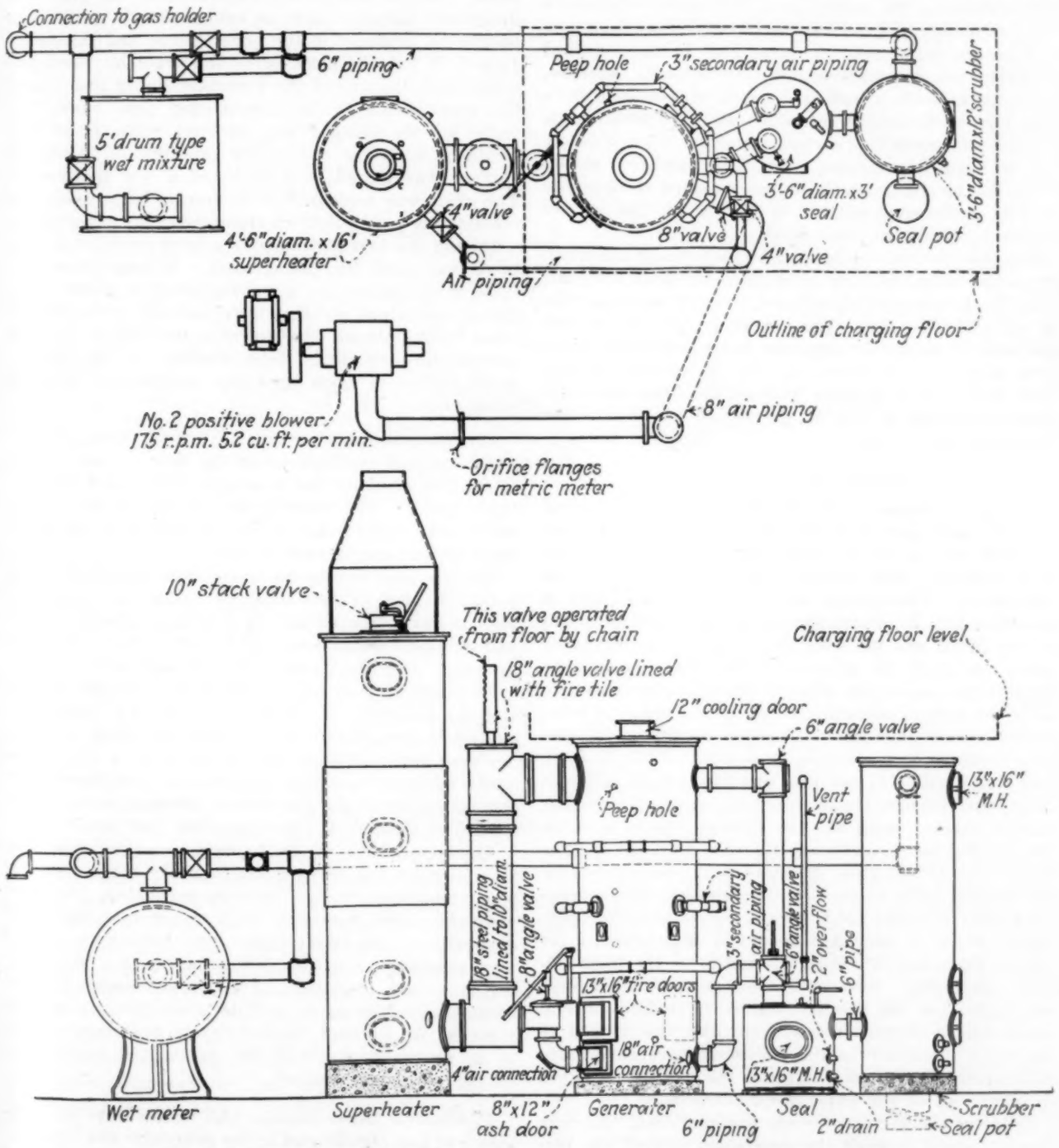



FIG. 2—EXPERIMENTAL PLANT FOR PRODUCING HYDROGEN BY DECOMPOSING OIL

in the formation of carbon dioxide is sufficient to raise the temperature of the products of combustion to about 2,500 deg. C. When air is introduced into the fuel bed at only one level, there is always a zone of increasing temperature corresponding to decreasing oxygen content in the gas stream. The maximum temperature is reached where all the oxygen is combined as carbon dioxide. Beyond that point, the temperature decreases because of the formation of carbon monoxide. It is, therefore, not merely wasteful of heat to permit unburned carbon monoxide to escape, but, in order to obtain a temperature in any region sufficiently high to decompose oil successfully, it is absolutely necessary to produce carbon dioxide in that region.

As blasting is continued from a single level and the temperature in the hottest zone increases, combustion becomes more rapid, and the width of the zone decreases to such an extent that the total heat in the coke bed available for decomposing oil may actually decrease. In order to have a sufficient depth of hot coke it is therefore necessary to introduce air at several levels at each of which the carbon monoxide formed below will be burned to dioxide. The ideal condition would, of course, be one in which air was supplied at all points in just sufficient quantity to oxidize all the carbon monoxide formed at lower levels.

The need for the checker-brick tower is also apparent. If carbon were the only solid used for heat transfer, as in the Rincker-Wolter process, it would be impossible to prevent the fuel from burning only to carbon monoxide or to prevent the blast gases leaving the plant at a very high temperature. By using the checker-brick tower it is possible to burn the blast gas completely and make it give up its heat to the brick where it is available for use.

## Construction of Plant

The plant employed in the experiments consisted of a 4.5-ft. water-gas generator and two shells of about the same size as the generator, each filled with checker brick, together with blower, scrubber, meter and other accessories. The general arrangement of the plant is shown in Fig. 2. Particular attention should be called to the three sets of "secondary" inlets, by means of which air could be introduced into the generator at three levels above the grate. These inlets proved to be of the utmost importance. Without them it is practically certain that no satisfactory results could have been obtained.

It was possible to use this plant in several different ways; for example, the oil could be vaporized on either coke or checker brick and the hydrogen could be withdrawn after passage through the coke only, the checker brick only, or the coke in series with one or both of the checker-brick towers. Unfortunately, the connections were not such as to permit the sequence of operations which is later described and recommended for a large plant and which is believed to be the most efficient thermally. Several of the possible procedures were tried and the results obtained in certain unusual cases will be mentioned later; but only the method of operation described in the following paragraph gave satisfactory results, and this was the method employed in nearly all of the experiments described.

Only one checker-brick tower was employed. Air was blown upward through the generator, entered the bottom of the checker-brick tower where air was added to burn the combustible gas present, and the blast escaped through the stack valve at the top of the tower. The oil was introduced at the top of the checker brick and traversed the two shells in the direction opposite to that of the blast, the hydrogen leaving the generator at the bottom. When hydrogen of sufficient purity was no longer produced or when the generator became choked with carbon, the introduction of oil was stopped, the carbon was burned from the checker brick with air, and the cycle repeated.

*Refractories.* The inner linings of both generator and checker-brick tower were of fireclay blocks of good quality. The lower 3 or 4 ft. of the tower lining was protected by a layer of split carborundum brick 1¼ in. thick. At the end of the experiments, the generator lining had fused to such an extent that it would have had to be replaced if the experiments had continued. Indeed, it was the blocking of the grate by fused material from the wall of the generator lining that caused the experiments to be discontinued just when they were; but the lining of the vaporizer remained in good condition until the end of the experiments. Only the surface was glazed to a depth of a few millimeters. The grate was made of 4x8-in. fireclay bars; these also remained in good condition throughout the experiments.

During the first experiments a good grade of fireclay brick was used for checkerwork. It was found that these brick had too low a melting point to permit satisfactory operation, and they were replaced, principally by silica brick. As an experiment a few special brick of several different kinds were included in the checkerwork, but all of them were less satisfactory than the silica brick.

*Facilities for Observation and Control.* Orifice meters were installed for measuring the flow of air to each of the four levels of the generator and to each checker-brick tower. The distribution of air to the various points was under fairly accurate control by means of these meters and throttle valves.

The oil used had to be forced into the shells, from a tank located at floor level, by means of compressed air. It was measured both by a friction-tube flow meter and by direct measurement of the oil in the supply tank by means of a glass gage and calibrated scale.

The rate of flow was governed as carefully as possible by observing the flow meter, but was necessarily subject to considerable fluctuations the effects of which are very apparent upon the curves showing the rate at which hydrogen was produced and also upon those showing the purity of the gas. The hydrogen produced was measured through a revolving-drum wet meter.

The composition of the hydrogen was recorded continuously by the thermal conductivity method, except when trouble with the sampling prevented. Analyses were also made frequently with an accurate volumetric apparatus of the Orsat type. The combustion method was generally used to determine carbon monoxide, methane and hydrogen. The carbon monoxide was occasionally determined also by absorption in cuprous chloride. All methods checked closely, and there appears to be no reason to doubt the substantial accuracy of all the important analyses.

*Pyrometric Measurements.* All temperature measurements of any significance in the generator and vaporizer were made with an optical pyrometer. Sight holes and

openings in the checkerwork were provided at heights of 3, 6, 9, and 12 ft. above the bottom.

Sight holes into the generator were provided at heights of about 2, 4, 6, 8 ft. above the grate. Because of obstacles which interfered with the use of the optical pyrometer, however, the holes at heights of 2 and 8 ft. were but little used. The opening 4 ft. above the grate was fitted with a stuffing box through which a 1-in. pipe with a sight cock and glass on the outer end could be rammed into the fire and the temperature of the fuel bed determined at a point at least 6 or 8 in. inside the lining. This arrangement was particularly satisfactory and it is regretted that space did not permit the use of the same device at the other sight holes.

It was the general rule, in making temperature measurements, to focus upon the hottest surface visible, since the surfaces near the shells were always cooled to some extent by radiation, and the hottest visible surface was probably never hotter than the average temperature at that level. Unfortunately, on account of smoke, no temperature readings could be made while oil was being introduced nor for a considerable time after the run. Even when the smoke had been cleared away by the air blast, the temperature observed had little significance until the porous deposit of finely divided carbon had been burned away. For that reason the frequent temperature readings taken in the earlier runs were later dispensed with and temperatures were taken for only a short time before a run.

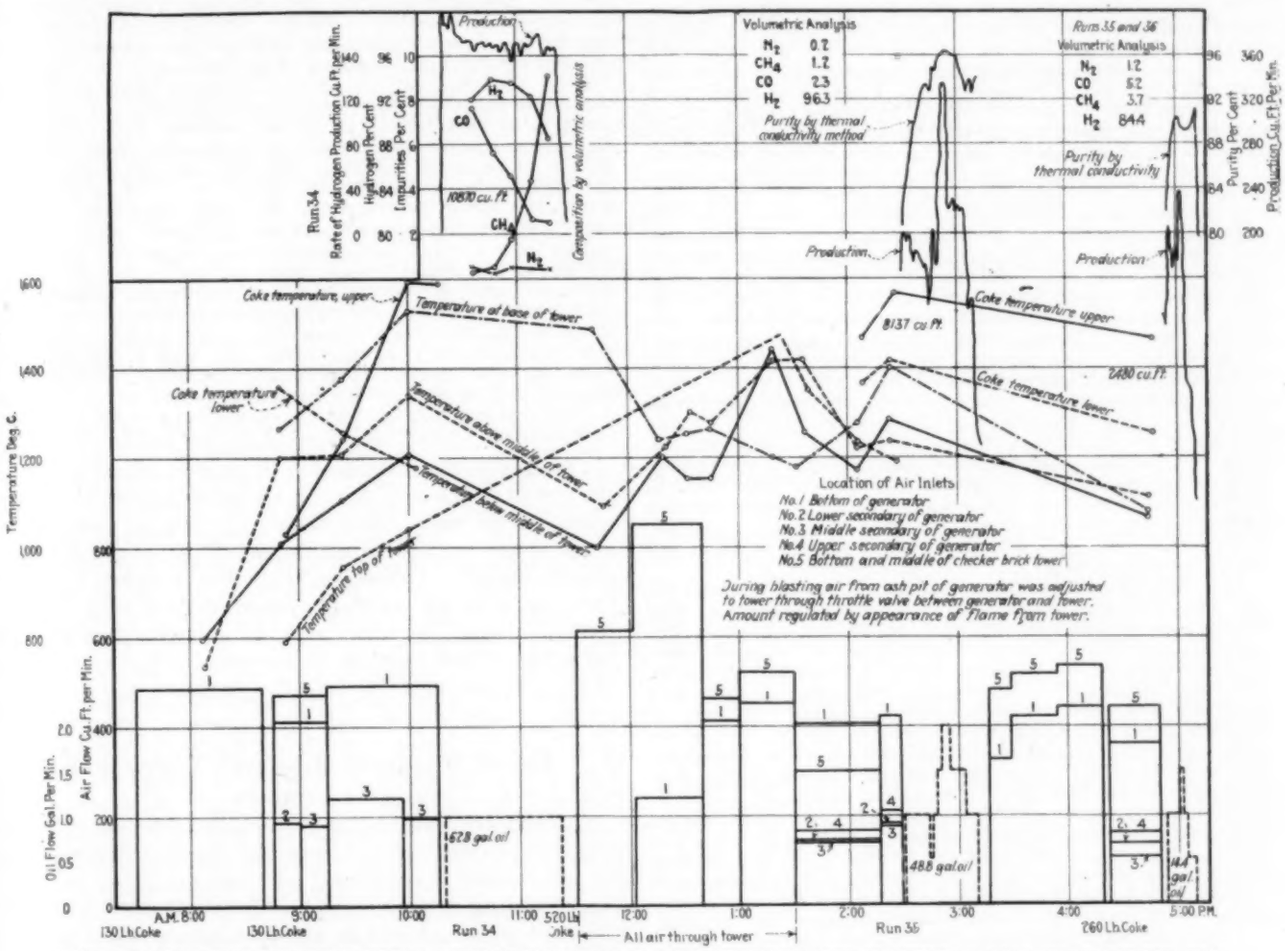



FIG. 3—DATA ON EXPERIMENTAL OPERATION OF OIL CRACKING PLANT ON JUNE 2, 1921, USING FUEL OIL AND PETROLEUM COKE

*Fuels.* Two grades of oil were used, kerosene and a refined fuel oil of considerably greater density, both purchased without specification or test from the regular stock of a local dealer. As will be shown later, the composition of the oil has but little influence upon the results obtainable. Neither oil contained an important amount of sulphur. Any sulphur present is converted quantitatively to hydrogen sulphide during the reaction and is easily removed from the gas in contrast to the organic compounds of sulphur formed at the low temperatures of carburetion of ordinary water gas. Three solid fuels were tried—an ordinary gas coke, petroleum coke and retort carbon. The apparent densities of the three solid fuels in loose piles were respectively about 27, 17 and 40 lb. per cu.ft. The gas coke was used for only a few runs until it became apparent that temperatures high enough to decompose oil could not be attained without fusing the ash to a clinker almost impossible to deal with. Petroleum coke was used during most of the experiments, the retort carbon, of which only a small supply was available, being reserved for a few runs at the end.

*Record of Observations.* The observations and all essential data taken during each experiment were plotted in colored inks on 40x50-cm. cross-section paper. A reproduction of one such sheet is shown in Fig. 3, which records the operation of the plant on June 2. The solid rectangular figures at the bottom of the sheet represent air blown into the various inlets of the generator and vaporizer; the height above the origin of the upper boundary of each rectangle represents the rate of air flow, and the area of the rectangle represents the total quantity of air delivered. Similarly the dotted

rectangles represent the rate and quantity of oil introduced into the vaporizer. The small circles connected by straight lines in the middle of the page represent observations of temperature made with the optical pyrometer. The irregular curves near the top of the sheet represent the rate of production and composition of the hydrogen made.

### Details of Plant Performance

The operation of the plant as shown by the data sheet will be followed descriptively for the purpose of illustrating the methods of experimentation and control, a knowledge of which is essential to an understanding of the discussion of plant performance which follows:

On the morning of June 2, 130 lb. of petroleum coke was charged into the generator and at 7:30 the blast was started, 485 cu.ft. per minute entering the bottom of the generator, from which enough was diverted to give practically complete combustion inside the checker-brick tower (as shown by the flame at the top of the tower). At 8:40 the blast was stopped for 5 minutes while an additional 130 lb. of coke was shoveled into the generator. From 8:45 until 9 air was blown into the bottom of the generator at the rate of 408 cu.ft. per minute, into the lower secondary air inlets at the rate of 182 cu.ft. per minute, and directly into the checker-brick tower at the rate of 476 cu.ft. per minute. At about 8:50 the temperature of the lower half of the coke bed was observed to be about 350 deg. hotter than the upper, consequently the lower secondary to the generator was closed and the middle one opened to pass air at approximately the same rate. At 9:15 the direct air line to the checker-brick tower was closed to permit mixing of the blast gas and secondary air before entering the tower, and the secondary air for the checker brick was taken by bypassing a portion of that entering the bottom of the generator, the amount taken being regulated as before to give a small pale flame at the stack. This permitted 240 cu.ft. per minute to be taken into the middle of the generator. At 9:45 the secondary air to the generator was cut down to about 200 cu.ft. per minute. Observation then showed temperatures in both generator and vaporizer well above 1,500 deg. C. At 10:15 the blast was stopped, and at 10:19 kerosene was introduced into the vaporizer at the rate of 1 gal. per minute. The rate at which gas was produced is shown by the wavy line at the top of Fig. 3.

At 11:21, 62 minutes after starting, 62.8 gal. of kerosene had been used and 10,870 cu.ft. of hydrogen produced. The composition of the gas produced, as shown by volumetric analysis, is given by the four curves under the rate curve. The maximum purity obtained was 93.8 per cent 27 minutes after the beginning of the run, the impurities at that time being 5.5 per cent of carbon monoxide, 0.4 per cent of methane and 0.3 per cent of nitrogen.

The generator was then charged with 520 lb. of petroleum coke and the blast started through the checker-brick tower only, in order to burn out the deposited carbon.

The upward movement of the hot zone of carbon-dioxide formation and the sharp fall of temperature after this hot zone has passed a given level can be seen quite clearly even from the small number of temperature observations made in this case. Blowing through the vaporizer alone continued until 1:30, when the carbon appeared to be practically burned out. The blast was directed into the generator at all four levels from 1:30 to 2:29 with a change in the secondary air to the checker-brick tower at 2:17. At 2:32 oil was again turned into the machine at the rate of approximately 1 gal. per minute. The lower irregular curve at the top of Fig. 3 shows the rate at which hydrogen was produced during the run, and the upper irregular curve is the record of the purity recorder. At 2:46 the gas had attained a purity of 92.8 per cent.

### Effects on Purity of Gas

If, as suspected, the principal impurity were now carbon monoxide produced at a rate independent of the rate of hydrogen production, the purity should be decreased by decreasing the rate of production. If the impurity were methane which had not been decomposed because of insufficient contact with a surface at high temperature, the purity should be improved by decreasing the rate of production. To test this point the rate of oil flow was cut to half a gallon per minute. The purity immediately dropped about half of 1 per cent, indicating carbon monoxide as the principal impurity. Without waiting to see how far this decline would go, the rate of oil flow was restored to 1 gal. per minute. The purity increased at once to 94.7 per cent. The rate was again increased to 1.5 gal. per minute. The purity again increased sharply. The rate of oil flow was increased to 2 gal. per minute, but without noticeable effect on the purity, indicating that conditions had been reached under which the effect of a further increase in rate upon methane production would more than offset its effect in diluting carbon monoxide. A sample taken at this time for volumetric analysis showed $N_2$ 0.2, CO 2.3, $CH_4$ 1.2 and $H_2$ 96.3 per cent. In about 5 minutes the purity of the gas at this rate had begun to fall off appreciably, unquestionably because of the formation of more methane as the machine cooled. The rate of oil flow was cut down to 1.5 gal. per minute to check this tendency. The effort was partly successful, a decided break toward horizontal occurring in the downward purity curve. The purity continued to drop off, however, and after running 1.5 gal. for 9 minutes the rate of oil flow was reduced to 1 gal. per minute. This resulted in an immediate increase in purity of a little more than 1 per cent, followed by a gradual decline. In about 5 minutes the impurity was as great as before the change in rate. The oil was then shut off entirely, but the production of hydrogen continued for some time, the purity at first increasing as the rate of production fell off and greater time of contact cut down the amount of methane, and then decreasing as the rate fell to so low a figure that the carbon monoxide again became the dominant impurity. The decomposition of 48.8 gal. of oil in 39.5 minutes had resulted in the production of 8,137 cu.ft. of hydrogen of an average purity of about 93 per cent. Burning out the carbon from the checker brick occupied the time from 3:18 to 4:20. At 4:20, 260 lb. of coke was put into the generator, and the coke bed was then blown for 28 minutes at all levels. Observation now showed the temperatures at various places to be about 100 deg. C. lower than at the beginning of the previous run. A run was made, nevertheless, primarily to test the effect of this difference of temperature. The effect is quite apparent from the purity curve, which reached at the maximum only 91 per cent. As was to be expected from the low purities, the effect of changing rate was just the opposite of that at the beginning of the preceding run. Volumetric analysis at once confirmed the conclusion that methane was largely the cause of the low purity of the gas.

The preceding description is merely illustrative of the results obtained during 15 days' operation of the plant under many conditions. It would require too much space to give the results of all these operations in greater detail. Consequently in the articles to follow this one only the more interesting data will be presented, mostly in the form of curves showing the variations from moment to moment in the compositon of the gas produced during the runs.

## Forest Products Research Carried On by Canada

The progress which has been made in forest products research in Canada is outlined in a recent bulletin issued by the Federal Department of Interior. This research work is being carried on at the Forest Products Laboratories at Montreal, and in addition special work is being conducted in a timber testing laboratory at Vancouver.

The work of the Montreal laboratories is divided into four main divisions—namely, pulp and paper, timber physics, timber tests and wood preservation.

The pulp and paper division has made detailed studies of the chemistry of Canadian woods in relation to pulp manufacture. Technical processes in the heating of pulp have been investigated. In the manufacture of sulphite pulp, experiments have been made in the penetration of cooking liquor in relation to moisture content, chips, etc. The utilization of waste sulphite liquor has been studied, also chipping, drying and baling of pulp for shipment. Other studies cover the efficiency of various newsprint splices, and the relation of humidity and temperature to moisture content of woods. Blotting paper has also been manufactured at the laboratories for the first time in Canada.

# Corrosion of Rustproofed Iron and Steel

## Galvanizing Is the Best Method of Protecting Against Rusting When Immersed in Fresh Water Saturated With Oxygen—Uncoated Iron and Low-Carbon Steel Corrode at About Equal Rates Under Those Conditions

By W. P. Wood
Assistant Professor of Metallurgical Engineering,
University of Michigan

THE experiments and results set forth in this article are presented with the idea of supplying some further data upon the corrosion rates of some common ferrous metals when unprotected and when protected by some of the well-known rustproofing processes. This work was carried out at the instigation and with the co-operation of one of the large central power stations of the Middle West.

The main interest in this investigation was centered upon the behavior of the samples when immersed in various waters. Nothing that is stated here is calculated to have any direct bearing upon the subject of corrosion of iron and steel when subjected to atmospheric conditions. The writer believes the two types of corrosion are somewhat different and should be approached separately.

A study of the recent work upon corrosion of iron and steel reveals the fact that it is felt by most authorities upon the subject that the rôle of oxygen in producing and accelerating corrosion is an exceedingly important one. This is particularly emphasized by W. D. Richardson[1] in his exhaustive and instructive series of experiments. While studying Mr. Richardson's work, the idea occurred to the writer that it might be feasible to use pure oxygen as a constant accelerator in corrosion tests, thus accomplishing, perhaps, the results which it has been hoped by some might be reached through use of the acid tests. It is quite well recognized that an indiscriminate use of acid tests in determining relative corrosion rates often leads to erroneous conclusions. It is also appreciated that some sort of reliable accelerated test would be very useful. In all the tests hereinafter reported the waters were kept saturated with oxygen, as nearly as possible, and determinations made upon the water showed the presence of considerable entrained oxygen.

It is felt that in order to have any comparative value corrosion tests should be carried out under as rigidly controlled and uniform conditions as possible. It is also believed that too wide an application of results obtained under one set of conditions should not be made. It is just this which has led to the great confusion in corrosion work which is apparent to any one interested. For instance, data which may be entirely applicable to corrosion by immersion in slowly moving waters will not be applicable when the water is moving with a high velocity or when quiet. The results of this work are felt to be applicable in waters that are slightly agitated by a slow motion. It is not proposed that the results of this investigation will have unlimited application over a wide range of conditions.

The metals used were pure open-hearth iron, wrought iron, open-hearth steel and a steel containing about 0.21 per cent copper. Analyses of these metals are given in Table I. Each metal, uncoated, was tested in two conditions, "as received" and after receiving a rough polish upon a 200 M wheel. Most of the metal "as received" was coated with a more or less uniform amount of mill scale. The pure open-hearth iron did not possess this covering of mill scale to as marked a degree as the other metals.

The protective coatings that were investigated were those obtained by calorizing, parkerizing, sherardizing, galvanizing and an electrolytic zinc process. It was realized that calorizing is not recommended as a protection against under-water corrosion, but it was thought that it would be of interest to include this process, as aluminum is electropositive to iron and should offer much the same advantages as a rustproofing material as does zinc. The physical condition of the aluminum coating and its method of application would be important factors. Previous to coating, each sample was polished upon a 200 M wheel in order to produce uniform surface conditions for the application of the coating.

Three waters were used as corroding mediums. These were distilled water, tap water and a special boiler-feed water. Analyses of the last two waters are presented in Table II. Particular interest was attached to the behavior of the tap water, since it was obtained from a system which makes use of liquid chlorine as a purifying agent.

It was not believed that any striking differences would develop between metals coated by the same process, and therefore it was not deemed necessary to run samples of all rustproofing processes upon all the metals. The samples which were actually run may be ascertained from Table III.

The dimensions of the samples were approximately

TABLE I—CHEMICAL ANALYSES OF METALS USED IN CORROSION TESTS

| Metal | C | Si | Mn | S | P | Cu | Slag |
|---|---|---|---|---|---|---|---|
| Open-hearth iron | 0.028 | 0.014 | 0.014 | 0.027 | 0.003 | ..... | .... |
| Wrought iron | 0.014 | 0.238 | 0.060 | 0.009 | 0.211 | ..... | 2.00 |
| Copper-steel | 0.124 | 0.073 | 0.346 | 0.035 | 0.009 | 0.215 | .... |
| Open-hearth steel | 0.122 | 0.059 | 0.297 | 0.034 | 0.026 | ..... | .... |

TABLE II—CHEMICAL ANALYSES OF TAP AND BOILER FEED WATERS

| Constituents | Tap Water, Pt. Per Million | Boiler Feed, Water, Pt. Per Million |
|---|---|---|
| Alkalinity (as $CaCO_3$) | 53.5 | Neutral |
| Chlorine | 7.6 | 1.8 |
| Sodium chloride | 12.6 | 2.9 |
| Total solid residue | 100.0 | 26.0 |
| Oxygen consumed | 2.7 | 2.1 |
| Silica | 4.0 | 1.2 |
| Iron and aluminum oxides | 2.6 | 2.8 |
| Calcium | 23.1 | 2.1 |
| Calcium oxide (CaO) | 32.3 | 2.9 |
| Calcium carbonate | 57.6 | 5.2 |
| Sulphates | Nil | Nil |
| Dissolved and entrained oxygen | 31.2 | 24.3 |

[1] *Trans.*, American Institute of Chemical Engineers, vol. 13, p. 169.

as follows: 2 in. long, 1 in. wide and ⅛ in. thick. Each test was carried out in triplicate in order to obtain reliable results and the average value of the three used in making computations. It might be stated at this point that in no case was there any wide variation among the three check samples. Each type of sample was exposed for four different lengths of time—1 month, 4 months, 8 months and 1 year. The total number of samples in each test was therefore twelve.

The dimensions of each sample were taken by means of micrometer and steel scale, after which the total area was computed. The samples were all washed in distilled water and 95 per cent alcohol and dried for one hour at 105 deg. C. in an electric oven, being subsequently stored in a dessicator until convenient to weigh them. Weighings were made correct to fourth decimal place. After weighing, the samples were placed in the water for the designated length of time, at the expiration of which they were removed and again washed, dried and weighed as before. Rust was nearly always flocculent, non-adherent and washed off very easily. In preparing the samples for immersion the idea in mind at all times was to maintain as nearly as possible uniform surface conditions.

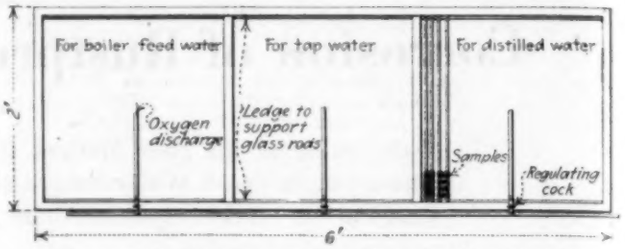



FIG. 1—SKETCH OF TANK USED IN CORROSION EXPERIMENTS

TABLE III—AVERAGE WEIGHT LOST IN MILLIGRAMS PER SQUARE CENTIMETER

| Description of Samples | In Oxygenated Distilled Water | | | | In Oxygenated Tap Water | | | | In Oxygenated Boiler Feed Water | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 Mo. | 4 Mo. | 8 Mo. | 12 Mo. | 1 Mo. | 4 Mo. | 8 Mo. | 12 Mo. | 1 Mo. | 4 Mo. | 8 Mo. | 12 Mo. |
| Open-hearth iron, ground | 2 | 9 | 20 | 32 | 1 | 12 | 23 | 31 | 5 | 16 | 25 | 33 |
| Wrought iron, ground | 3 | 8 | 11 | 24 | 4 | 12 | 20 | 30 | 3 | 9 | 14 | 21 |
| Copper steel, ground | 2 | 11 | 21 | 30 | 4 | 11 | 19 | 26 | 3 | 13 | 21 | 31 |
| Open-hearth steel, ground | 2 | 17 | 24 | 30 | 6 | 10 | 18 | 26 | 2 | 10 | 19 | 24 |
| Open-hearth iron, as received | 0.6 | 14 | 23 | 34 | 4 | 13 | 24 | 33 | 3 | 24 | 13 | 34 |
| Wrought iron, as received | 2 | 11 | 14 | 22 | 4 | 10 | 18 | 30 | 2 | 8 | 16 | 24 |
| Copper steel, as received | 3 | 12 | 18 | 31 | 2 | 8 | 15 | 25 | 2 | 11 | 23 | 35 |
| Open-hearth steel, as received | 3 | 14 | 20 | 32 | 3 | 10 | 16 | 26 | 2 | 9 | 16 | 24 |
| | Gain | Gain | Gain | Gain | Gain | Gain | Loss | Loss | | | | |
| Open-hearth iron, calorized | +1 | +1.5 | +1.4 | +0.7 | +0.2 | +0.5 | 0.1 | 9 | 0.2 | 1 | 3 | 5 |
| | Gain | Gain | Loss | Loss | Gain | Gain | Loss | Loss | | | | |
| Open-hearth steel, calorized | +0.9 | +1.5 | 0.5 | 3 | +0.4 | +0.2 | 6.5 | 9 | 0.4 | 4 | 6 | 11 |
| Open-hearth iron, sherardized | ... | .. | .. | .. | 0.3 | 2 | 3 | 7 | 0.3 | 1 | 3 | 6 |
| Copper steel, sherardized | 0.2 | 1 | 3 | 5 | 0.3 | 1.5 | 4 | 8 | 1 | 2 | 5 | 9 |
| Open-hearth steel, sherardized | 0.2 | 1 | 3 | 5 | ... | .. | .. | .. | .. | .. | .. | .. |
| Open-hearth iron, galvanized | ... | .. | .. | .. | 1 | 1 | 2 | 3 | .04 | 1 | 2 | 3 |
| Wrought iron, galvanized | 0.3 | 1 | 2 | 2.5 | 1 | 1 | 2 | 4 | 1 | 1 | 2 | 4 |
| Open-hearth steel, galvanized | 0.4 | 1 | 1.5 | 2.5 | ... | .. | .. | .. | .. | .. | .. | .. |
| Open-hearth iron, electrolytic Zn | ... | .. | .. | .. | 0.4 | 1 | 4 | 9 | 0.5 | 1 | 2 | 4 |
| Wrought-iron, electrolytic Zn | 0.1 | 1 | 1 | 3 | 0.4 | 1 | 2 | 4 | 0.5 | 1 | 2 | 3 |
| Open-hearth steel, electrolytic Zn | 0.2 | 1 | 1 | 3 | ... | .. | .. | .. | .. | .. | .. | .. |
| Open-hearth iron, parkerized | ... | .. | .. | .. | 0.4 | 2 | 4 | 5 | 0.3 | 3 | 7 | 11 |
| Copper steel, parkerized | 0.4 | 1 | 3 | 4 | 0.5 | 1 | 5 | 5 | 0.4 | 3 | 9 | 14 |
| Open-hearth steel, parkerized | 0.5 | 4 | 10 | 15 | ... | .. | .. | .. | ... | .. | .. | .. |

Some exception might be taken to the statement that weighings were correct to the fourth decimal place. This criticism might be particularly applicable to the weighings made subsequent to immersion, as it was not always possible to wash off the last trace of adherent rust from the samples. Some experiments were made to determine the relative error introduced from this source and it was found that these last traces of rust, which in many cases were mere discolorations, weighed only a few tenths of a milligram, even though they appeared quite bulky at times.

In all, about seven hundred samples were run in this series of tests. The great difficulty involved was in keeping track of each sample during the entire process. Each sample was stamped with a number as soon as it was cut from the original stock. "As received" samples were stamped lightly, in order to avoid a tendency for corrosion at that point. Polished and coated samples were stamped more deeply, as the marks were subsequently nearly obliterated by the polishing and rustproofing operations. It was observed that in only a few instances did this number cause excessive local corrosion and even then the difference in weight was very slight when these samples were compared with their checks which had not exhibited the excessive corrosion around the number. Such facts all demonstrate the great importance of uniform surface conditions in corrosion phenomena.

## APPARATUS

Before describing the apparatus by means of which the corrosion tests were carried out, it will probably be advisable to review some of the conditions which are known to effect corrosion and which must be taken into account in carrying out corrosion tests. These conditions were obtained from a study of the work of other investigators, more particularly the work of Heyn and Bauer.[2] In all there are about twenty-one factors[3] that influence corrosion, but the five enumerated below were considered of the most importance. They are:

1. Rise in temperature of the corroding liquid usually increases rate of corrosion.

2. An increase in depth of immersion decreases corrosion.

3. An increase in the exposed surface of the liquid increases corrosion.

4. Chemical impurities in the liquid increase the action.

5. The corrosion is usually in direct ratio to the amount of liquid present.

Most of the variables may be partly eliminated in the following manner: (1) Use same amount of liquid, (2) run tests at same temperature, (3) use same depth of immersion, (4) use pieces of metal from same stock piece. In building and locating the immersion tank the conditions enumerated were kept in mind.

A diagram of the tank used will be found in Fig. 1. As will be seen it is a three-compartment tank, 6 in. deep, built of 1-in. lumber. A narrow strip of wood was fastened around the inside of each compartment 4 in. from the bottom to support the glass rods, which

[2] *Mitteilungen aus dem Königlichen Materialprufungsamt*, 1908-1912.

[3] A. F. Wendler. An unpublished manuscript on corrosion.

in turn supported the samples. Commercial oxygen was supplied by tanks and was brought into each compartment through a steel pipe manifold and glass delivery tubes; its flow was regulated by a rubber hose connection and a stock cock. Oxygen was regulated in such a manner that about one bubble per second rose from each delivery tube. This bubbling produced a slight but constant agitation of the water in the tank. A space about 6 in. square was left in the center in which no samples were placed.

Since it has been shown that light has an effect upon rate of corrosion, each compartment of the tank was supplied with a tight-fitting wooden cover. These covers also prevented objects from falling upon the samples and, most important of all, maintained the atmosphere over the surface of the water much richer in oxygen than normal, a condition maintaining a more uniform and larger concentration of oxygen in the water. Table II gives data on the amount of oxygen carried in one test. No doubt the concentration varied largely at times.

Samples were laid flat in order to eliminate the variations in corrosion rate by varying depths of immersion. A depth of 2 cm. of water was maintained over the upper surface of the samples. Evaporation losses were made up by occasional additions of pure distilled water. In placing samples in the tank care was taken to make a uniform distribution in order to offset any local conditions obtaining in various parts of the tank.

The tank was placed in a room where the average yearly temperature variation was not over 15 deg. F. from the average yearly temperature of 70 deg. F. The tank never received the direct rays of the sun; moreover, the sun shone in the room only a short time during each day.

The flow of oxygen was kept practically constant over the entire year. There were, of course, some unavoidable breaks occasioned by leaks in the delivery system or in the valves on the oxygen tanks. On the average one tank of oxygen would last about 3 weeks.

## Results for Uncoated Metals

Results are presented in Table III, which give total losses for the periods noted. Rate of corrosion may be had by dividing those figures by 30, 120, 240 and 360 respectively.

During the first few months of the test nearly all of the samples were corroding at a more rapid rate than they were during the last months of the year. This is probably due to the accelerating effect of the oxygen being gradually overcome by the formation of a protective coating of flocculent rust which does not entirely inhibit corrosion but regulates its rate. There seems to be no evidence that the composition of the water has any general effect in bringing about this primary acceleration.

It is seen that all four metals are corroding at not widely varying rates at the end of the year, the point of interest lying in the fact that the open-hearth iron is corroding more rapidly than any of the others about 80 per cent of the time. This is in accordance with the observations of Richardson, and is due to the large amount of oxygen present.

Wrought iron and steel corrode at about the same rate under the circumstances here present. The writer feels that this is about the situation which will be found generally where these two metals are concerned.

There is some difference in the corrosion phenomena between the polished and unpolished samples. The majority of the "as received" samples corrode more slowly at first than the polished samples, probably due to the protective skin of oxide. This effect is transient and at the end of a year the samples are all corroding at about the same rate and have similar surface conditions.

Samples in tap water were watched with interest on account of the chlorine content of the water, but the effect of the chlorine is apparently not very pronounced. It seems to accelerate corrosion of wrought iron, but it is believed that the increased corrosion would not be large.

Whether the introduction of a few tenths of 1 per cent of copper will suppress corrosion of iron and steel when immersed in water is still being debated in some quarters. As far as results of these tests are concerned the copper does not appear to affect the corrosion in any way. In general, small variations in the composition of iron and steel are practically without effect as influencing corrosion by immersion.

Probably the most vital thing to be observed in corrosion experiments is the tendency toward pitting. Loss in weight provides a means for comparative study, but the pitting tendencies of a metal are what determine its actual value. This point is stressed by most authorities upon the subject. An examination of the uncoated samples in this investigation failed to establish any notable differences in this respect among the four metals tested. The only statement which can be made is that the samples immersed in tap water (which, it is remembered, carries dissolved chlorine) showed slightly more tendency to form pits than the samples immersed in the other waters.

## Rustproofed Samples

*Calorized Samples.*—Calorized samples acted in a very erratic and unexpected manner. All the samples with the exception of those in boiler feed water showed a gain in weight for 4 months. After that an appreciable loss in weight began. The preliminary gain was probably due to the oxidation of aluminum upon the surface of the samples.

After 8 to 12 months' immersion the samples showed very noticeable evidence of corrosion, the weight in most cases approaching or becoming less than the weight of the original sample. Great variations in this respect were noted. The most serious aspect of this corrosion was a very pronounced tendency toward pitting. This is no doubt due to the uneven surface of the calorized metal.

While the results of this investigation did not indicate a very desirable behavior of calorized metal when immersed in water, there were certain aspects which would lead to the conclusion that if the aluminum coating could be smoothly and evenly applied, it would furnish an excellent corrosion-resisting surface.

*Sherardized Samples.*—Sherardized samples all showed a more or less steady increase in the rate of corrosion, but the corrosion was less marked in distilled water. Corrosion was extremely localized—not one sample showed an even corrosion all over its surface. Rust would soon perforate the sheet or pipe which had been thus "protected."

*Galvanized Samples.*—These samples showed much the best resistance to corrosion. At first they lost weight as rapidly as the other rustproofed samples, but

afterward the rate of corrosion became constant and very slow. The most important thing in connection with these samples was this: Careful examination failed to reveal any evidence of local action or pitting. In fact the samples which were immersed for a year did not give any visible evidence of the long immersion.

*Electrolytic Zinc Process.*—Next to the galvanized samples, these exhibited the best average results. At first corrosion was not very marked, but about half the samples speeded up after the first 6 months. At the end of a year some of the samples were corroding very rapidly and the protective coating had disappeared over large areas. Corrosion appeared to start over much broader areas than in sherardized samples. No serious tendency toward pitting was observed.

The Parkerized samples exhibited erratic behavior similar to that evidenced by the calorized samples. Some samples showed steadily increasing and very decided corrosion. Others were nearly as good as galvanized metal. In some the dark-colored coating had entirely disappeared. However, there was no tendency toward pitting.

It was very evident that large variations were present in the thickness and character of the coating. If these conditions were investigated and uniformity established, it is possible that this coating might have a distinct value, under some circumstances, as a protective coating for iron and steel articles when immersed in water.

SUMMARY

1. The presence of oxygen apparently causes an exaggerated initial corrosion in iron and low-carbon steel.
2. The presence of a small amount of chlorine in tap water causes a slight but not serious increase in corrosion rates of immersed metals.
3. The composition of iron and steel does not affect noticeably the corrosion rate when metal is immersed in water. This applies particularly to the presence of copper.
4. Different surface conditions of a metal tend to become equalized over a period of time and the corrosion rate to become steady and uniform when the metal is in the presence of large amounts of oxygen.
5. The presence of large amounts of oxygen does not appear to increase the tendency toward pitting in a corroding piece of iron or steel.
6. Galvanizing seems to offer the best means of preventing the corrosion by immersion of iron and steel.

## New Type Vertical Retort

A new style construction of the Glover-West vertical retort has been prepared in the course of the reconstruction of eighty vertical retorts at the Belfast, Ireland, plant. The *Gas Journal* (London), of March 28, page 821, describes the modified form as follows: "The retorts will be increased in length by the addition of a steaming chamber at the base. In this chamber, which takes the form of an enlargement of the retort section, the steam, introduced for the purpose of water-gas generation in the retort, is raised in temperature, at the expense of the residual heat of the coke, to that necessary for the water-gas reaction. By the adoption of the new principle, the yield of gas in this installation will be increased by 2 million cu.ft., and the labor cost per setting, remaining constant, will be correspondingly less per 1,000 cu.ft. of gas made."

# Legal Notes

BY WELLINGTON GUSTIN
Of the Chicago Bar

## Demurrage Charges Held to Be Taxable

**Are Part of Payment for Transportation, Though Made Primarily to Discourage Detention of Cars**

In two cases, the Procter & Gamble Co. versus United States and the Buckeye Cotton Oil Co. versus United States, the Federal District Court held that demurrage charges for failure to load and unload cars within the "free time" permitted by the rules of railroad companies were taxable as a part of the charge for transportation, under the revenue acts of 1917 and 1918 imposing a tax on the amount paid for transportation, since "demurrage" is a terminal charge, a part of the charge for transportation, even if the purpose of demurrage is primarily to prevent the detention of cars.

The cases arose under the revenue acts, title 5, sections 500-503, of the act of 1917, and title 5, sections 500 to 502, of the revenue act of 1918, imposing a tax on the amount paid for transportation, and involved the question of whether demurrage charges to load and unload cars within the "free time" permitted by the rules should be included as part of the cost of transportation and thereby subject to tax. Article 2 of regulation 49 provided that the word "transportation," as used in title 5 of the revenue acts mentioned, included "receipt, delivery, elevation, transfer in transit, ventilation, refrigeration, icing, storage, demurrage, towing, lighterage, trimming of cargo in vessels, wharfage, handling of property transported, feeding and watering live stock, and other incidental services and facilities." Plaintiffs contended that a charge for demurrage was not taxable as a part of the charge for transportation. (281 Federal 1014.)

## Insufficient Memorandum of Sale

**Rules Set Forth Relating to Correspondence and Oral Evidence Under Statute of Frauds**

Controversy over a sales contract between the Western Metals Co., of Cleveland, Ohio, and the Hartman Ingot Metal Co., of Chicago, emphasizes some valuable information to buyers and sellers. The former brought suit against the latter and obtained judgment, but this has been reversed by the Appellate Court and then affirmed by the Supreme Court of Illinois, 303 Ill. 479.

On Nov. 2, 1918, the presidents of the two corporations met by chance in Cleveland in the office of a mutual acquaintance. There was some talk then regarding a sale by the former to the latter of a quantity of scrap brass. Following this conversation the former sent the latter a confirmation of a sale upon a printed blank for 25 tons of red brass borings at 20c. per lb. and 25 tons of clean light brass at 13c. per lb., calling for shipment within 3 months with regular terms. In response to this the Ingot Metal Co. sent a letter refusing to accept any shipments of metal until such time as notice was given, owing to a badly congested condition at the plant. On Nov. 11 the Western Metals Co. asked the alleged buyer to notify it when conditions would make a ship-

ment possible. No reply was made to this letter. On Dec. 4 the claimed seller again wrote the alleged buyer advising that it was shipping 50 tons scrap covered by the contract. The buyer wired that it would refuse to accept the shipment. On the same day it notified the seller by letter that it would under no circumstances receive any materials until it had notified seller to make shipment.

On Dec. 9 the seller replied by saying it would comply with the request for a short time, but would not withhold shipment much beyond Jan. 1. On receipt of this letter the alleged buyer replied that no shipments were to be made until specific instructions were sent to that effect. On Jan. 3 the seller requested shipping instructions at once. Four days later the alleged buyer replied as follows:

"On account of the government canceling orders on all purchases they have made, we are likewise canceling all written orders we have given our trade. We might have given you a verbal order, and this would be under the same ruling as all written orders we have given others."

Following receipt of this letter the Western Metals Co. began suit in Chicago for breach of contract. The Hartman Ingot Metals Co., defendant, pleaded the statute of frauds of both Ohio and Illinois and denied liability generally. A jury returned a verdict for $4,500 in favor of the seller and judgment was rendered thereon. The higher courts have now reversed this judgment.

### Statute Requiring a Writing

That an oral contract of sale was made in Cleveland by the presidents of the opposing corporations was established by the jury and the judgment of the trial court. But the appellate courts found that the action was barred because of the provisions of section 4 of the uniform sales act, commonly called the statute of frauds. This section provides:

"A contract to sell or a sale of any goods . . . of the value of $500 or upward shall not be enforceable by action . . . unless some note or memorandum in writing of the contract or sale be signed by the party to be charged or his agent in that behalf." Hurd's Rev. Statutes, 1921, page 2855.

The seller contended that this sale of brass was not within the statute and therefore the law applied was erroneous. The court said it was not necessary, in order to take the contract of sale out of the statute, that there be a formal written contract, nor is it necessary that the written memorandum be complete in one writing. It is now established that a complete contract, binding under the statute of frauds, may be gathered from letters, writings and telegrams between the parties relating to the subject matter of the contract and so connected with each other that they may be fairly said to constitute one paper relating to the contract, though only one of the writings may be signed by the party to be charged.

No particular form of language is necessary to constitute the memorandum requisite to satisfy the requirements of the statute. Any kind of a writing, from a solemn deed down to mere hasty notes or memoranda, from which the intention of the parties may be gathered, as in other contracts, will be sufficient.

It is equally well established, says the court, that the signed writing or writings must refer expressly to the other writing, or the several writings must be so connected, either physically or otherwise, as to show by internal evidence that they relate to the same contract. (32 L. R. A. 127.) A paper signed by the party to be charged cannot be incorporated in a paper not signed by him by a reference in the latter. The signed paper must refer to the unsigned paper in clear and distinct terms. (27 Corpus Juris, 263.)

Oral evidence is inadmissible to connect the several papers or show that they relate to the same transaction. Oral evidence can only bring together the different writings, it cannot connect them. They must show their connection by their own contents. The connection must be apparent from a comparison of the writings themselves. (25 Ruling Case Law 680.)

### What Oral Evidence May Show

After the several writings connect themselves together into one complete memorandum, parol proof is proper to show that the several writings apply to the subject matter of the suit, and not to some other sale. This is equally so in case the complete memorandum is contained in one writing. The rule with respect to the admission of parol proof is the same, whether the memorandum is to be found on one paper or on several papers which connect themselves together. The wisdom of the rule forbidding the use of oral evidence to show the connection between the several papers is apparent, says the court.

On this point it says: "If it is necessary to use oral evidence to show that the papers are parts of one contract of sale, then the contract becomes partly oral and partly written and we have then introduced all the mischiefs which the statute of frauds and perjuries was intended to prevent. The line must be established somewhere, and that line has been wisely established at a definite point. If we break across this line and permit the use of some oral evidence to connect the writings, then we introduce into the law confusion and uncertainty, because no one will know how much oral evidence will be permitted to join the several writings in a given case."

Going over the correspondence in the case at bar, the court said such admitted the existence of a contract of the sale. That this sale was made was not questioned in the Supreme Court. The question presented was whether this correspondence makes out a memorandum of this contract of sale, complete in all its terms, and signed by the buyer. The court found that the letters nowhere made the slightest reference to the confirmation, nor did the buyer ever admit the confirmation correctly stated the terms of the contract. Conceding that its letters admit the existence of the oral contract sale, there was nothing in the letters, nor in any paper to which the letters refer, that states any of the terms of the contract, says the court.

Finally, it is unquestionably the law that the memorandum upon which it is sought to charge a party to a contract must state the contract with such certainty that its essentials can be known from the signed writing, or by some reference to parol proof to supply the essential elements of the contract or to supply the connecting links between the signed writing and some other writing or writings.

In this case the correspondence offered in evidence did not meet these requirements, and the court so found, affirming the Appellate Court judgment which had reversed the trial court judgment for the seller.

Machinery and Appliances for Production and Control

# Equipment News

***From Maker and User***

Materials and Accessories for Chemical Industries

## Gasoline Shovel

The Pawling & Harnischfeger Co. of Milwaukee has brought out a 1-yd. gasoline shovel mounted on corduroy traction, which should have a wide application in shovel work. Shovel users will be interested in this new machine, because it is one-man operated, does away with fuel and water hauling and starts and stops instantly without requiring overtime work for firing.

This shovel is similar in design to ¾-yd. machine that was brought some

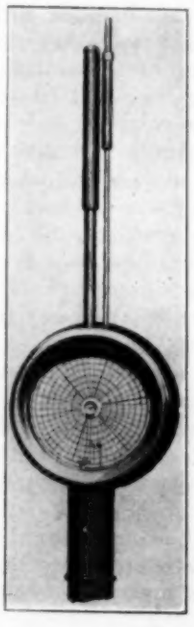
NEW 1-YD. SHOVEL

years ago by the Pawling & Harnischfeger Co. and that is in use all over the United States. One of the principal features of the gasoline shovel is its crowding motion, which has proved successful on the ¾-yd. machine. The pinion on the shipper shaft is driven by a heavy steel chain from a set of planetary gears mounted in the forward drum of the machine. This mechanism can shake the dipper very rapidly, which is extremely necessary when operating in clay. It also can force the dipper into the toughest soil.

This machine can be used with dragline bucket, clamshell, pile-driving rig or crane hook. The Aluminum Co. of America, American Agricultural Chemical Co., Lincoln Clay Products Co., American Brass Co. and many industrial companies are using these machines with good success. Like the smaller machines, it is built throughout in a thorough manner, being made principally of steel; forged alloy shafts being used for heavy duty parts. Gears are all of steel with cut teeth. The traction is one of the most important parts of the machine and is of heavy construction. The track links are of single piece special steel castings joined by alloy steel pins. There are two pair of driving and idler sprockets on each machine and the corduroys are non-cloggable even in the heaviest going.

## Economy Recorder

The Uehling Instrument Co., Paterson, N. J., has developed and placed on the market a new combined barometer and vacuum recorder primarily for determining (1) the absolute back pressure in steam turbine and condensing plants, (2) the barometric pressure, (3) the condenser vacuum, (4) the existence of air leakage into the condenser, etc., and (5) the ability of the condenser to handle the load. This combined recorder consists merely of two float chambers, one of which is connected with a barometric mercury column and the other with a mercury column in communication with the condenser. These columns and float chambers are secured to the recorder case. The pens are actuated by means of floats resting on the mercury in the two chambers. The movements of the floats correspond exactly to the changes in barometric pressure and in vacuum.



The measurement of barometric pressure and vacuum by means of mercury columns is standard for power plant testing, and therefore the readings of the combined barometer and vacuum recorder are at all times accurate and reliable. There is no necessity for calibrating the recorder against mercury column testers as is customary with instruments utilizing diaphragms, tube springs and multiplying lever mechanisms.

The recorder draws automatically and continuously the barometer and vacuum records on the same chart. The barometer record is used as a base line for reading the absolute back pressure directly off the chart. As long as the two curves, barometer and vacuum, vary simultaneously and proportionately, everything is as it should be. However, should the vacuum fall when the barometer remains constant, either considerable air is leaking into the condenser or the condenser is not able to handle the load.

By means of the recorder chart the operator is at all times able to ascertain whether his turbine or condenser is operating as efficiently as it should, and to know whenever air is leaking into the system, thereby impairing the vacuum and causing an unnecessarily high turbine steam consumption. The existence of air leakage is instantly revealed, and thus can be located and eliminated by the operator before an appreciable waste or heat loss is incurred. The instrument records any part of the total range of 0 to 31 in. Vacuums from 25 to 31 in. and the corresponding absolute back pressures, or vacuums from 20 to 31 in., etc., may be recorded with great accuracy over nearly the full face of the chart, the remainder of the chart being used for recording, on a contracted scale, the lower vacuums down to atmospheric pressure.

## Catalogs Received

STURTEVANT MILL CO., Boston, Mass.—Catalog 77H, descriptive of the Sturtevant Moto-Vibro Screen, an inclined vibratory screen, featuring the different ways which this can be installed.

STURTEVANT MILL CO., Boston, Mass.—Booklet. Description of the Sturtevant Acidulating Unit installed at the Armour Fertilizer Works, Columbus, Ga.

LOUIS ALLIS CO., Milwaukee, Wis.—Catalog on the Watson Multi-Speed Motor, a motor which operates on a polyphase alternating current having adjustable speed through field control over a range of from two to four speeds.

# Book Reviews

## Books on Mineral Resources

Two excellent booklets have recently been published by our English cousins, books that will prove welcome to all who have interest in the sources and statistics of metal and mineral production. One is printed by the Imperial Mineral Resources Bureau (H. M. Stationery Office, London, 218 pages, price 4s. 3½d.), and presents a digest of statistical and technical information relative to the production of silver, especially during the war period (1913-1919). It is one of a long series of such tracts recently published. Turning its pages one is struck with the evident care used in its compilation and the comprehensiveness and conciseness of the volume.

No less valuable should be the monograph on Copper Ores, written by Robert Allen and published by the Imperial Institute (published by John Murray, Albemarle St., W., London; 220 pages, price 7s. 6d.). This is one of a series published by the Institute giving a general account of the occurrences and commercial utilization of the more important minerals.

---

EL ARTE DE LOS METALES. Translated, from the Spanish of *Alvaro Alonzo Barba*, by *Ross E. Douglass* and *E. P. Mathewson*. New York: John Wiley & Sons, Inc. 288 pp. illus. Price $3.50.

The eminence of Dr. Mathewson in the profession of metallurgy will tend to enhance the popularity of this translation, made in collaboration with Ross E. Douglass, of what is recognized as the oldest published treatise on American metallurgy. Barba, the author, was at one time an ecclesiastic at Potosí, Bolivia—noted during many centuries for its fabulously rich silver mines; the book was first published in Spain in 1640. Translations, into English, French and German, have been made at various dates, but these are incorrect, inaccessible and lacking in a proper interpretation of the technology of Barba's day. Students of metallurgy, particularly those who have followed the history of mining in South America, should be grateful to the translators, both of whom are unusually well qualified to present an English version without mutilation of the original sense.

Book I discusses "The Manner in Which Ores Are Begotten, and the Things That Accompany Them." In it are described such considerations as the smell and taste of earths, and their recognition thereby, a defence of the opinion that sulphur and mercury are the components of metals, and sundry other quaint arguments and views. Book II deals with the amalgamation of silver and gold ores; Book III, the treatment by cooking (pan amalgamation); Book IV, the reduction of ores by smelting, and Book V describes the practice of refining and parting. The greater part of the treatise, therefore, forms a thesis on a subject in which the author had gained much experience and formed sundry basic conclusions, many of which were in error and not a few were influenced by religious views. The translators have peppered the English version with comments, in brackets, which will prevent the metallurgically uninitiated from accepting too readily many of the conclusions. The volume is illustrated by several informative cuts that show the equipment used by metallurgists in the seventeenth century and thereabouts. It should find a place in every library of mining and metallurgical works of reference, as a record of what was being done and the standard and practices of technology in those far-off times.

A. W. ALLEN.

---

TECHNICAL ANALYSIS OF STEEL AND STEEL WORKS MATERIALS. By *Frank T. Sisco*. McGraw-Hill Book Co., Inc., New York. 6x9¼ in., 543 pp., with 28 illustrations in the text and 26 tables. Price $5.

Of all the branches of analytical chemistry, the analysis of steel undoubtedly has received the greatest amount of attention, judging from the large number of books already published. To write a book of any considerable novelty is a matter of some difficulty. However, the author has produced a book which marks a distinct departure from the manuals of steel analysis previously published.

This book is written from the standpoint of the rapid and accurate analysis of steel and steel works materials for commercial purposes.

The first quarter of the book, Part 1, is devoted to the design, equipment and operation of the laboratory. It is the first adequate discussion of these topics from a practical standpoint that has come to the attention of the reviewer and is a distinct contribution to the literature of the subject. The chapters on "The Qualifications and Selection of Laboratory Employees," "The Organization and Efficient Operation of the Steel Works Laboratory," and "Errors in Routine Analysis and Their Control" will be of considerable interest to those who have charge of laboratories, and valuable to beginners in such positions. The chapter on "Record Keeping and Costs for Steel Works Laboratory" will prove of considerable assistance in those laboratories where such matters are too frequently neglected.

Part 2 deals with "The Analysis of Plain and Alloy Steels." The methods as a whole are well selected and carefully worked out in detail. The chapter on "The Determination of Carbon in Plain and Alloy Steels" is excellent.

Part 3 is devoted to "The Analysis of Steel Works Materials" and includes the analysis of pig iron, cast iron, the ferro-alloys, ores, fluxes, refractories and slags.

The English in a few places is a little "sloppy," as "a new 5-gal. bottle syphoned from a carboy of solution." In standard works previously published, Ehrlenmeyer is invariably capitalized, likewise Meyer and Gooch. The author always uses the above terms uncapitalized, and yet capitalizes Nesbitt. It would be preferable to adhere to the standard practice in such matters.

This book is commended to the attention of university and college professors teaching analytical chemistry. Students who contemplate entering the field of metallurgical work should read this book. The rapidity and accuracy with which work is done in a steel laboratory will be quite a revelation to them.

Superintendents and managers in steel works would be considerably enlightened, doubtless, by reading Part 1.

G. W. WALKER.

---

## Metallurgical Transactions

JOURNAL OF THE INSTITUTE OF METALS, vol. 28. Edited by *G. Shaw Scott*. The Institute, 36 Victoria St., London, S. W. 1; 1,008 pages. Price to non-members, 31s. 6d.

JOURNAL OF THE IRON AND STEEL INSTITUTE, vol. 106. Edited by *George C. Lloyd*. The Institute; and Spon & Chamberlain, 123 Liberty St., New York; 457 pages. Price, $9.50.

These publications are much alike in general plan. Each gives over about half its space to abstracts of current technical literature in its respective field. The first half of each book is occupied with the papers read before the fall meeting, together with contributed discussion. Both institutes are now paying a great deal of attention to the advanced phases of physical metallurgy, metallography and the properties of heat-treated alloys—the Institute of Metals even more than the older association. It is an interesting speculation whether this is a true reflection of the weight of importance which the "practical" and "theoretical" aspects of the art are held by the members of societies, or whether it is only an evidence that the advanced students find more time and urge to write about their doings than the ambitious operator.

At any rate, either type of man will find great stimulation in many articles in both books. By that same token the books will not be overly interesting to the rule-of-thumb operator. But even the chemical engineer can find much to interest him. Thus, the May Lecture of the Institute of Metals was by Sir Ernest Rutherford, on "The Relation of the Elements," which dips even as deep as the structure of the atomic nucleus.

The other volume contains a paper by J. H. S. Dickenson with this imposing title: "Some Experiments on the Flow of Steels at a Low Red Heat, With a Note on the Scaling of Heated Steels." In it, and its appended discussion, will be found some very interesting history of the Claude synthetic ammonia process—how they tried first one metal, then another, each catalyzing tube following the other out through the roof in fragments until the proper alloy was finally discovered.

E. E. THUM.

# Synopsis of Recent Literature

## Solder for Aluminum*

Most of the metals commonly used in solders, except magnesium, are electropositive to aluminum, so that any metals used in making a soldered joint of aluminum act electrolytically in the presence of moisture as positive galvanic poles, accelerating the corrosion of the aluminum. Magnesium cannot be utilized advantageously even though it is electronegative to aluminum, because the metal disintegrates rapidly in the presence of moisture. Soldered joints of aluminum which are to be exposed to moisture should be protected against corrosion by a paint or varnish.

Various compositions of zinc-tin and zinc-tin-aluminum solders give the best results. The tensile strength of a good aluminum solder is about 7,000 lb. per sq.in., for those with higher tensile strength have, in general, their temperature of complete liquation too high for soldering purposes. As a rule the strength of an aluminum-soldered joint depends upon the type and upon the workmanship.

## Pulsations in Gas Flow

For the purpose of studying the nature of pulsation and to discover some practical means of reducing or eliminating it or of compensating for its effects on the devices used for measuring fluid flow, a joint investigation was undertaken by Ohio State University and the A.S.M.E. The results are reported in a paper in *Mechanical Engineering* for April, 1923, by Horace Judd and Donal B. Pheley.

The investigation was confined to the venturi meter, the orifice, the flange nozzle meter and the pitot meter, using air flow from a small compressor discharging into a 3-in. line.

The apparatus used for this investigation was chosen with great care and the experiments were conducted so carefully that the authors regard it as highly probable that the basic principles established would be fundamental for gas, steam and water as well as air and also for other sizes and kinds of installations.

The conclusions reached as a result of the investigation may be summarized as follows:

### Nature of Pulsations

*a.* Pulsations in a pipe line, originating from a reciprocating system, or a similarly disturbing system, consist of sudden changes both in the velocity and in the pressure of the fluid.

*b.* The pressure change is the most apparent and is probably the greatest factor in producing errors in metering devices.

*c.* The pressure change is in the form of a wave front resembling a traveling sound wave of low frequency.

*d.* The pressure wave travels in the pipe with the velocity of sound.

*e.* The velocity of the pulsation is independent of the velocity or quantity of fluid flowing.

*f.* Pulsations in air flow are similar to the compression waves set up by water hammer. Both travel at the velocity of sound in the fluid and are independent of the velocity of flow.

*g.* The effect of this pulsation on a flow meter is to increase its reading, often causing an error of great magnitude. The magnitude of this error depends upon the frequency of pulsation, nominal static pressure of the fluid, type of meter used and adjacent fixtures in the pipe line.

*h.* With orifice meters and flange nozzle meters the pulsating error increases as the diameter of the orifice, or nozzle, approaches the diameter of the pipe.

*i.* The throttling or modification of the manometer connections to the meter does not appreciably reduce the error.

*j.* The point of attachment of manometer connection has no great effect on the error due to pulsating flow.

*k.* The pulsation error at the center of the pipe is 35 per cent less than that at the wall of the pipe.

*l.* A meter on a "dead-end" connection will usually show a positive error of considerable magnitude.

*m.* The pulsation must be eliminated or greatly reduced in order to have the meter read without objectionable error.

### Practical Elimination of Pulsations

*n.* Because of the high velocity of the pulsation, an excessive length of pipe line would be necessary to destroy the pulsation.

*o.* Throttling is effective but requires a pressure drop of 6 in. of mercury to reduce the error to 5 per cent.

*p.* Abrupt volume enlargements in the pipe line will eliminate the error, if of sufficient capacity. A volume capacity of 20 cu.ft. is required for an error within 2 per cent.

*q.* Generally speaking, for the same capacity, a volume of relatively large diameter is more effective than one of small diameter.

*r.* No relation was found between the compressor displacement and the capacity of the volume chambers.

*s.* The combination of throttling with volumes forming the "muffler" device probably is the most effective device for the mechanical elimination of pulsations.

*t.* The pulsating bag, or diaphragm, and the fan, or revolving baffles, are partly successful in eliminating the pulsations, but their installation is thought to offer serious practical objections.

*u.* The effectiveness of any of these quieting devices seems to depend upon their ability to dissipate or change the energy of pulsation, which is effected chiefly through a drop in pressure.

*v.* The device that will destroy the pulsating energy with the least obstruction to the flow of the fluid is the most desirable.

*w.* The effectiveness of the meter element itself in quieting the pulsation depends upon the degree of restoration of the pressure beyond the meter. The greater the percentage of restoration the higher the percentage of error shown for any given type of meter.

### Adjustment of Error of Pulsation

*x.* It is probably not feasible to correct any meter by means of a correction factor owing to the disturbing effects which may arise from slight changes in the installation and running conditions.

*y.* The experimental establishment of a pulsating correction factor and its relation as shown in the formula proposed in the complete paper is not considered feasible with our present experimental knowledge of the laws of pulsating flow.

*z.* It seems probable that each installation where pulsating flow is pres-

*Abstract of circular of Bureau of Standards, No. 78. The complete paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 5 cents.

## Important Articles In Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. Those that are of unusual interest will be published later in abstract in this department; but since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

Making Alcohol From Waste Molasses. D. Jessurun. *Sugar*, April, 1923, p. 173.

Use of Calcium Chloride as a Protection Against Freezing Concrete. P. Cottringer and H. S. Kindel. *Concrete*, April, 1923, pp. 150-156.

La Viscose. Sa Preparation et ses Propriétés. André Graire. *Chimie et Industrie*, March, 1923, pp. 454-462.

La Théorie Thermique de la Distillation et de la Rectification de l'Air. P. Mion L. Gay. *Chimie et Industrie*, March, 1923, pp. 463-468.

Testing the Quality of Lubricating Oils. Winslow H. Herschel. *Proc.* of the Eng. Soc. of Western Penn., vol. 38, No. 10, pp. 503-41.

The Fundamentals of Colloids as Applied to Paints and Varnishes. E. W. Fasig. *Can. Chem. & Met.*, pp. 90-92, April, 1923.

Oxidation of Hydrocarbons, With Special Reference to the Production of Formaldehyde. T. S. Wheeler and E. W. Blair. Part II. Action of Oxygen on Methane. *J. Soc. Chem. Ind.*, vol. 88, p. 92T, March 16, 1923.

Comparative Efficiency of Fish Meal. D. B. Dill. *Am. Fertilizer*, vol. 58, No. 7, April 7, 1923.

Soil Chemistry—Relations Between the Active Acidity and the Lime Requirement of Soils. E. T. Wherry. *J. Wash. Acad. Sci.*, vol. 13, No. 6, March, 1923.

Ferroconcrete and Its Applications to Gas-Works Construction. J. Twist. *Gas Journal* (London), April 11, p. 105.

ent would present its own peculiar problem for which an individual study and consideration of the existing conditions would be necessary for a satisfactory solution.

The complete paper contains illustrations of apparatus, indicator and photopulsometer diagrams, tables giving the data obtained in the investigation, and a bibliography of the subject. It also discusses the possibility of adjustment of errors at considerable length.

### Recording Gas Calorimeter

The research sub-committee of the British Institution of Gas Engineers has reported on the Fairweather recording calorimeter. This investigation has gone into great detail regarding this instrument and its possibilities. The *Gas Journal* (London) is presenting this report serially beginning with its issue of Feb. 21.

### Executive Control of Steam Costs

The efficient production and utilization of the steam in the paper mill is a problem of primary importance. Rising costs of coal, labor and power equipment make the elimination of waste absolutely essential. F. H. Childs, in the *Paper Trade Journal* of March 29, 1923, clearly shows where losses occur, and also demonstrates their possible prevention. The lack of co-operation between engineer and executive is apparently the chief cause of neglect to remedy the conditions, which are in many cases extremely bad. Dollars and cents furnish the only possible yardstick whereby the executive may appreciate the significance of the engineer's data.

In facing the problem there are three phases to be considered: First, to find out where one stands in relation to the results that others are getting; second, to find out quickly and economically what is wrong if results are unsatisfactory; and third, to devise, at reasonable expense, methods for controlling costs in the future. The degree of efficiency of generation and distribution is determined with comparative ease. Assuming a reasonable boiler efficiency and knowing the amount of coal burned in the year, it is possible to calculate what the probable steam production for the year is. The steam required in various operations is next figured. To estimate consumption of various units it is agreed that none can vary greatly if reasonably good practice is assumed. Such items as steam for power can be calculated very closely, while such operations as that of drying can be approximated with reasonable accuracy. Cooking stock or heating process water are more difficult to approximate, but still it is possible to make a close estimate. Once located, losses may be largely eliminated.

As an example of efficient management it is shown that with a mill producing 10,000 tons of paper per year, the possible saving amounts to upward of $70,000 if conditions are changed from those of ordinary mill practice to those of most modern and efficient practice. With coal costing $6.50 per ton, it is shown that $70,000 would be saved in a mill that had an actual boiler efficiency of 50 per cent but a possible efficiency of 80 per cent and whose actual drying efficiency was 50 per cent, whereas the theoretical efficiency was 90 to 100 per cent. Careful control of the drying operation by maintenance of conditions found to be most satisfactory after experiments at wet and dry ends, and operation of the boiler plant at the most efficient load and with the best possible utilization of fuel, are the only measures that must be taken in this particular case to effect the savings named.

## Review of Recent Patents

### American Patents Issued April 17, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,451,711—Vulcanized Rubber Solution. W. B. Pratt, Wellsley, Mass., assignor to E. H. Clapp Rubber Co., Boston, Mass.

1,451,734—Leaching of Copper Ores and Recovery of Copper. Joseph Irving, Bisbee, Ariz.

1,451,739—Apparatus for Refining Crude Oil. John Mayes, Wichita, Kan.

1,451,755—Method of Producing a Protective Coating on Objects of Magnesium or of Magnesium Alloys. C. B. Backer, Bergen, Norway.

1,451,786—Process for the Purification of Phosphoric Acid by Crystallization. W. H. Ross, C. B. Durgin and R. M. Jones, Washington, D. C., assignors to the people of the United States.

1,451,839—Evaporating Apparatus. H. S. Melliott, Morenci, Mich., assignor to By-Products Recovery Co., Toledo, Ohio.

1,451,843—Manufacture of Resinous Condensation Products. H. Plauson, Hamburg, Germany.

1,451,847—Electrically Heated and Controlled Steam Boiler. W. H. Rowe, Jacksonville, Fla.

1,451,850—Mercurial Composition. H. McC. Spencer, Newark, N. J., assignor to Seydel Chemical Co., New York.

1,451,883—Means for Ventilating Drying Ovens. A. Maehler, Chicago, Ill.

1,452,009—Process for Utilization of Ammonia. J. F. Wait, New York City.

1,452,016—Slime Pulp Thickener. C. Allen, El Paso, Tex.

1,452,024—Rotary Compressor. H. A. Campbell, Oakland, Calif.

1,452,027—Catalyzer for the Synthetic Manufacture of Ammonia and Manner of Producing Same. I. W. Cederberg, Stockholm, Sweden, assignor to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway.

1,452,061—Gas Expansion and Absorption Process. J. C. Bertsch, Tulsa, Okla.

1,452,083—Black Azo Dyestuffs. A. L. Laska and A. Zitscher, Offenbach-on-the Main, Germany, assignors to Chemische Fabrik Griesheim-Elektron, Frankfort, Germany.

1,452,086—Process for the Manufacture of Solid Plastic Material From Casein. F. G. Maries, Kingston, England.

1,452,129—Dyeing Machine. F. C. W. Stelter, Astoria, N. Y.

1,452,145—Apparatus and Method for Carrying Out Catalytic Oxidization of Ammonia With Oxygen. I. W. Cederberg, Berlin, Germany.

1,452,151—Continuous Thickening Process. A. L. Genter and G. C. Jones, Salt Lake City, Utah, assignors to the General Engineering Co., Salt Lake City and to A. L. Genter.

1,452,166—Apparatus for Drying Char. H. E. Niese, Morristown, N. J., assignor to the American Sugar Refining Co., New York City.

1,452,185—Alkali-Metal Product and Process of Producing the Same. H. W. Charlton and R. N. Shreve, New York City, assignors to American Potash Corp. of New York City.

1,452,186—Accelerating Agent in Potash Recovery. Same inventors and assignees as 1,452,185.

1,452,206—Means for Dehydrating Alcoholic Liquids. M. D. Mann, Roselle, N. J., assignor to S. B. Hunt, Mount Kisco, N. Y.

1,452,218—Pulverizing Mill. R. E. H. Pomeroy, Canton, Ohio.

1,452,226—Boll Weevil Destroyer. M. A. Spencer, Yonkers, N. Y., assignor of one-half to B. E. Nussbaum, Muskogee, Okla.

1,452,253—Liquid and Vapor Separator. H. G. Nevitt, Tampico, Mexico.

1,452,288—Water-Softening Apparatus. J. E. Caps, Wilmette, Ill.

1,452,309-310—Asphalt Structure and Composition, Gustav Monrath, New York City, assignor to Barber Asphalt Paving Co., Philadelphia, Pa.

1,452,315—Process for Bleaching Barytes. J. B. Scheuer, Lanett, Ala.

1,452,322—Method of Segregating Olefines. L. C. Stewart, Medland, Mich., assignor to the Dow Chemical Co., Midland, Mich.

1,452,380—Liquid Fuel Furnace. C. G. Hawley, Chicago, Ill.

1,452,388—Process and Apparatus for Centrifugal Separation. C. A. Porter and O. C. Brewster, Casper, Wyo., assignors of one-half to P. Sullivan and G. R. Hagens, both of Casper, Wyo.

1,452,389—Paper Waxing and Sizing Composition. F. L. Pullen, Oldtown, Me.

1,452,445—Silicate Composition. Léon Seidman, New York City.

1,452,450—Burner for Metaldehyde. C. Tommasi, H. Dannell and A. Busch, Basel, Switzerland, assignors to Elektrizitatswerk Lonza, Gampel, Switzerland.

1,452,478—Process of Making Nickel Formate. C. Ellis, Montclair, N. J.

1,452,481—Manufacture of 1.4 Naphthol Sulphonic Acid. J. Baddiley, J. B. Payman and E. G. Bainbridge, Manchester, England, assignors to British Dyestuffs, Ltd., Manchester, England.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

**Rubber Accelerator**—Patents have been issued to Sidney M. Cadwell, assignor to the Naugatuck Chemical Co., for a process of vulcanizing rubber by means of an accelerator comprising certain derivatives of thiuramdisulphide containing substituted alkyl and aryl groups. One of the most satisfactory derivatives, dimethyldiphenylthiuramdisulphide, is prepared from monomethylaniline (480 parts), carbon disulphide (170 parts) and iodine (285 parts), dissolved in alcohol and allowed to stand. The product which is formed crystallizes out after standing about 2 hours and is filtered, washed with a

little alcohol and dried. In carrying out the invention described in this patent, 100 parts of rubber, 10 parts of zinc oxide, 3 parts of sulphur and 1 part of dimethyldiphenylthiuramdisulphide are mixed in the mill at the ordinary temperature and for the usual time. After the mixing is accomplished, the material is vulcanized for 10 minutes or longer under 40 lb. steam pressure. (1,445,621. Feb. 20, 1923.)

**Preparing Oxalic Acid**—A catalytic process for the oxidation of carbohydrate material to oxalic acid by means of nitric acid in the presence of phosphoric acid and a vanadium catalyst has been described by George Kolsky, of Mamaroneck, N. Y. According to the procedure he outlines, an aqueous solution of phosphoric acid in about 50 per cent concentration is introduced into the carbohydrate material (sugar, glucose, starch, dextrine, etc.), together with an appropriate amount of nitric acid. It is said that a satisfactory reaction mixture might contain equal amounts by weight of water, nitric anhydride and phosphoric anhydride. The reaction is carried out preferably in the presence of vanadium pentoxide or other similar catalyst at a temperature range of 30 to 70 deg. C. After cooling the resulting mixture of oxalic acid and spent liquor, the crystallized acid is removed by centrifugal action or filtration and the spent liquor is denitrated by raising its temperature and blowing air through it. The denitrated spent liquor is then brought into absorptive contact with the fumes evolved during the oxidizing step and the fumes and the air from the denitration, to form a mixture of phosphoric and nitric acid suitable for re-use in the process. (1,446,012. Feb. 20, 1923.)

**Chlorhydrins of Organic Liquids**—Benjamin T. Brooks, assignor to the Chadeloid Chemical Co., describes a process for the manufacture of chlorhydrins of various liquid or solid organic substances, preferably oils containing one or more chemically unsaturated groups, such as the olefine group or ring structures which behave similarly to the olefine group. By this process, unsaturated petroleum oils (either the lighter or heavier distillates), unsaturated hydrocarbons of the terpene type and unsaturated fatty acids or their esters (such as those of oleic or linoleic acid) are converted into the corresponding chlorhydrins. Of the terpene compounds, the commonest and cheapest is ordinary spirits of turpentine. Apparently the presence of other substances which are chemically inert, such, for example, as saturated petroleum hydrocarbons, benzol, carbon tetrachloride, etc., do not interfere with the reaction—in fact, they may be of advantage in some cases. Thus certain solid or semi-solid fatty oils or other organic substances, such as cinnamic acid, stilbene, etc., may be successfully treated by dissolving the substance in an inert solution, such as gasoline, kerosene, benzene or carbon tetrachloride. These organic substances are treated with an aqueous solution of hypochlorous acid, but not in the high concentration which has been described in previous published work. It is difficult or impossible to carry out the process economically on a large scale when the solutions contain more than about 3 per cent of hypochlorous acid. In the present invention, the unsaturated organic liquid is continuously subjected to the action of a cold dilute aqueous solution of hypochlorous acid in an exceedingly dilute solution. It is possible to carry out the reaction smoothly and with sufficient rapidity to meet the requirements of commercial large-scale operation even when aqueous solutions containing 0.25 per cent of hypochlorous acid are employed. In the preparation of the aqueous solution of hypochlorous acid, the chlorine is passed into a dilute solution of an alkali carbonate or bicarbonate. Since it is well known that carbonic acid is a stronger acid than hypochlorous acid, in fact will displace the latter from its salts, the hypochlorous acid does not become fixed in the form of hypochlorite salts, but remains in a free or uncombined state and is therefore available for direct combination with the unsaturated substances to form the desired chlorhydrins. (1,446,873. Feb. 27, 1923.)

**Effect of Alkalinity on Lithopone**—One of the most baffling sets of facts that the paint technologist has to face is the great variation in consistency obtained when equal volumes of different pigments are incorporated in equal volumes of the same vehicle, such as oil or varnish. But even more baffling to the paint technologist is the fact that often when equal volumes of different lots of lithopone are incorporated in equal volumes of the same vehicle, mixtures are obtained which vary widely from one another in consistency. The consistency of a mixture of a pigment with an appropriate vehicle, such as oil or varnish, is dependent upon the ease with which the pigment is wet by the vehicle. Different brands or lots of lithopone have often been found in practice to differ widely in the ease with which the pigment is wetted by a particular vehicle. Many of the commercial brands of lithopone are difficultly wetted by many desirable oils and varnishes, or, as the paint mixer says, lithopone "fights" these vehicles during the mixing operation. On the other hand, occasionally a highly alkaline lithopone is found which is wetted by the vehicle with reasonable ease, but then thickening or livering reactions of the resulting mixture are generally encountered.

Frank G. Breyer and Clayton W. Farber, assignors to the New Jersey Zinc Co., have discovered that the ease with which lithopone incorporates with a vehicle or is wetted by it is largely proportional to the degree of alkalinity manifested by the lithopone. Most commercial lithopone at the present time will give a neutral or slightly acid water solution. It is believed that this property accounts for the difficulty experienced in incorporating it with the vehicle. However, there are certain brands of lithopone which give a strongly alkaline water solution; particularly is this true of those lithopones in which magnesium oxide has been added with a view of improving the light resistance. Such strongly alkaline lithopones exhibit marked tendencies to liver and thicken on standing or aging and are objectionable on this account. It has been found that the alkalinity of the lithopone therefore must vary over a relatively narrow range. The most desirable range of alkalinity and that covered by this patent is a product which when subjected to a precision alkalinity test with methyl orange as an indicator requires between 2 and 4 cc. of *N*/50 sulphuric acid for titration to a faint pink color of 100 cc. of a clear filtrate obtained from a mixture of a 50-gram sample of the product with 250 cc. of distilled water agitated for 5 minutes at a temperature between 65 and 75 deg. F. (1,446,637. Feb. 27, 1923.)

**Manufacture of Arsenic Acid and Arsenical Compounds**—In the manufacture of arsenic acid it is usually the custom to heat arsenic trioxide in nitric acid. Oxidation by means of chlorine in an acid aqueous medium is proposed by Carleton Ellis and Vernon T. Stewart, of Montclair, N. J. For example, 1 part of a commercial grade of white arsenic is mixed with 7 parts by weight of water and the mixture is heated to boiling. Chlorine gas is bubbled through until a sample shows permanently blue with starch and potassium iodine in the presence of sodium bicarbonate. Iron may be removed by treating with sodium acetate and filtering off the basic acetate formed. The resulting solution of arsenic acid may be treated directly with milk of lime to form tricalcium arsenate or with lead oxide or hydroxide to form lead arsenate. (1,447,203. March 6 , 1923.)

**Soluble Arsenic Compound**—The effective poisoning ingredient in an arsenic compound designed for use in sprays, dips, poison baits, etc., is the arsenious oxide and it is therefore important that a maximum amount of this ingredient be obtained in solution. Heretofore, according to the patent of Joseph F. Cullen, assignor to the United States Smelting, Refining & Mining Co., the maximum amount of available arsenious oxide has been about 30 per cent by weight, and to secure this amount at least equal molecular proportions of alkali to white arsenic have been required. In the process described in this patent 2,500 lb of caustic soda is added to 7,500 lb. of water, in a suitable container, and immediately thereafter 10,000 lb. of a good grade of white arsenic is added. On agitation, the heat of reaction is sufficient to dissolve all of the arsenious oxide. Using these quantities of ingredients, approximately 1,250 gal. of concentrated solution containing 50 per

cent of arsenious oxide, 37½ per cent of water and 12½ per cent of alkali expressed as caustic soda is obtained. This solution contains approximately 8 lb. of arsenious oxide to the gallon, whereas most concentrated solutions now on the market contain not over 4 lb. of arsenious oxide to the gallon. Usually the concentrated solution will be shipped directly to the place of use, where it may be further diluted to meet the needs of the particular requirement. Or a solid compound can be obtained by evaporation of this concentrated solution. The compound thus obtained is said to be completely soluble in water. (1,446,160. Feb. 20, 1923.)

**Production of Diarylguanidines**—If an alcoholic ammoniacal solution of diarythiourea is mixed with finely comminuted lead oxide at a temperature below boiling point of the solution, diarylguanidine is produced. In order to remove the latter substance from the solution it must be treated with acid, filtered and precipitated with caustic alkali. The method in general applies to all di-substituted guanidines. Excellent yield and purity of product are claimed to have been effected by this method invented and patented by Y. Young, of Caldwell, N. J., and E. G. Croakman, of Buffalo, N. Y. They have assigned the rights to the National Aniline & Chemical Co., of New York. (1,446,818. Feb. 27, 1923.)

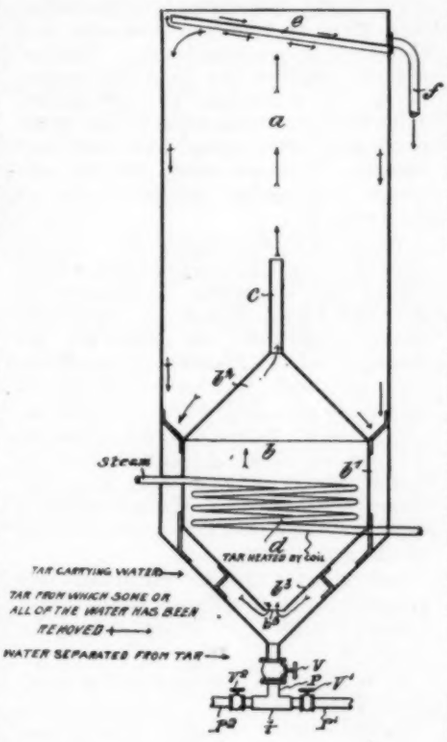
**Dehydrating Coal Tar**—In this invention, for the purpose of separating water from coal tar, the tar is projected upward in a stream so as to impinge against a separating surface. This separates out the water carried in the tar mechanically.

The apparatus comprises a separator *a*, cylindrical and formed with a conical bottom, the vessel being of greater height than transverse dimensions. The height of the vessel may be two and one-half to three times its diameter. In the lower end of the vessel is fitted a tar heater *b*, which comprises a cylindrical portion $b^1$ and a conical upper portion $b^2$ with or without an upwardly projecting outlet tube *c*. The tar container *b* is also formed with a conical bottom $b^3$ to correspond with the conical bottom of the vessel *a*.

The conical bottom $b^3$ is open at its lower end at $b^4$ and the upper conical portion $b^2$ or outlet tube c is open at its top so that, when the vessel *a* is filled to or just above the top of baffle *e*, the contents of the tar container *b* communicate with the contents of the vessel *a*. The container *b* is fitted with a heating coil *d* for heating the container and the upper end of the vessel *a* is fitted with an inclined transverse separating plate *e* which is spaced at its upper edge as shown from the vessel *a*. Above the lower end of the transverse plate *e*, the vessel *a* may be provided with a drain pipe *f*.

In operating this apparatus the tar to be dehydrated can be run in through the valved pipe $p'$, valve *v* and $v'$ being open, and valve $v^2$ being closed. The pipe *p* at the bottom of the tapered part at the bottom of tank *a* has a valve *v*. This pipe may be connected to a T-pipe *t*, to the two ends of which are connected a supply pipe $p'$ and an exit pipe $p^2$ or a wholly separate pipe may enter the tank *a* at any suitable point for admitting the tar to be treated.

The tar contained in the tar container *b* is heated by means of the heating coil *d* and thus given a considerable upward tendency so that a stream of tar is projected upwardly through the tube *c* with a sufficient velocity to impinge against the separating plate *e*, whereupon the water carried with the tar is separated therefrom as liquid water and adheres to the under surface of the plate *e*, traveling upward along it until it creeps over the upper edge and flows down the upper surface of the plate *e*, while the dehydrated tar gradually flows back again and is distributed over the whole of the interior of the vessel.




Practical experience has shown that satisfactory results are obtained when the tar is heated to a temperature of 50 to 65 deg. C. In the course of 20 to 24 hours the water contained in the tar was, in a particular run of the process, reduced to about 3 to 4 per cent, which is generally admitted to be sufficient for all practical purposes.

When sufficiently dehydrated the tar can be run out by opening valves *v* and $v^2$. The pipe $p^2$ will conduct the treated tar to a storage vessel or elsewhere. (1,448,593. Paul Jaworski, Bismarckhutte, Germany. March 13, 1923.)

**Liquid Fuel**—This combustible is obtained by mixing in appropriate apparatus, at the convenient pressure and temperature, the following three ingredients: nitro-benzol, alcohol, preferably ethyl alcohol, and nitrous ether. These are mixed in such proportions as to form a homogeneous mixture. The proper proportions are as follows: Nitrobenzol, 0.75 per cent; ethyl alcohol, 99 per cent; nitrous ether, 0.25 per cent. To this mixture is added a dye soluble in alcohol, such as the rosaniline or fuchsine hydrochlorate, the result being a liquid of greasy nature, scarlet red color, intense, penetrating and persistent odor similar to that of the bitter almonds, boiling at 80 deg. C., and having a specific gravity of 0.80.

It is claimed for this fuel that its heating and dynamical efficiency is greater than that of the fuels used now and that it produces in the explosion a high temperature and pressure which are maintained until the combustion is completed. It is also claimed that it has the advantages of producing light and aromatic residues free from acetic acid; of not promoting the formation of carbon in the cylinders; of being a high rust protective and lubricant on account of its oleaginous and ethylic nature, thus tending to protect the engine organs; of being more economical than any of the other combustibles now used, and of not being dangerous, for it is not flammable at the usual temperature. (1,448,245. Miguel Llomparty Valdés and Vicente Baullaoy Villar, Havana, Cuba. March 13, 1923).

**Composition for Rendering Paper Greaseproof**—Casein and emulsified coconut oil form the basis of a greaseproofing composition patented by Wilbur L. Wright, of Fulton, N. Y., the proportions being as follows: Casein, 100 parts; emulsified coconut oil, 100; water, 1,000; ammonia, 10 parts. The casein is dissolved in the ammonia diluted with part of the water, the oil and remainder of the water are added, and the resulting mixture is heated to 175 deg. F. until a homogeneous product is obtained. (1,449,718. March 27, 1923.)

**Reactivating Spent Catalyzers**—It has been found that finely divided spent nickel or other catalyzers may be regenerated by subjecting them to a resurfacing treatment—for example, by grinding or abrading the spent catalyzer, admixed with oil, in a ball mill whereby the particles are freed from their inert or inactive surfaces. The present invention covers an additional treatment, the resurfacing being described in a co-pending application, Serial No. 222,007. The resurfaced catalyzer particles are heated to 200 to 250 deg. C. in admixture with a relatively small amount of oil and a stream of hydrogen is passed through until the maximum increase in activity, as determined by test, is obtained. Due to the large amount of catalyzer in proportion to the oil present, it seems probable that the activation is due to the replacement of absorbed gases on the catalyzer by hydrogen. (1,447,689. William D. Richardson, of Chicago, assignor to Swift & Co. March 6, 1923.)

# Men in the Profession

A. W. AMBROSE, assistant director of the Bureau of Mines, resigned recently to become associated in an executive capacity with the Empire Companies, with headquarters at Bartlesville, Okla. Mr. Ambrose was superintendent of the government experiment station there until 1920, when he went to Washington as chief petroleum technologist. From 1914 to 1919 he was associated with California, Texas and Louisiana oil companies.

G. A. BOLE, superintendent of the Ceramic Experiment Station of the Bureau of Mines at Columbus, Ohio, was in Washington last week to discuss the refractories program with bureau officials.

JOHN DAVIS, a member of the Bureau of Mines staff, who has been stationed in Washington, has been selected to take charge of the helium production plant at Fort Worth, Tex.

M. D. HERSEY, of the Pittsburgh Station of the Bureau of Mines, is in Washington in connection with the bureau's work on oxygen-oil explosive mixtures.

Dr. IRA N. HOLLIS, who for the past 10 years has been president of Worcester Polytechnic Institute, has tendered his resignation to the board of trustees of the Institute, to take effect some time within the next 3 years, or as soon as his successor is chosen. Dr. Hollis plans to retire from teaching in order that he may devote some time to literary work.

E. J. MCCONE, general manager of the Buffalo *Commercial*, was the principal speaker at the banquet held during the convention of the Electric Steel Founders' Research Group at East Aurora, N. Y., on April 13 and 14, at which were present representatives and executives of the five electric steel foundries forming the group. Mr. McCone spoke on the subject of "Americanization of the Employer."

R. A. MILLIKAN addressed the Physics Club of the Bureau of Standards, April 18, on "The Penetrating Radiations of the Upper Air."

GEORGE C. MITCHELL, an official of the Pope-Gosser China Co., Coshocton, Ohio, has been elected president of the United States Potters' Association, succeeding Frank P. Judge, Jr., Salineville, Ohio. Other officers elected were: B. E. Salisbury, Onondaga Pottery Co., Syracuse, N. Y., first vice-president; D. William Scammel, Maddock Pottery Co., Trenton, N. J., second vice-president; Guy C. Crooks, Crooksville China Co., Crooksville, Ohio, third vice-president, and Charles F. Goodwin, East Liverpool, Ohio, re-elected secretary-treasurer.

LANDON C. MOORE, a consulting chemist of Dallas, was in Washington last week.

R. B. MOORE, chief chemist of the Bureau of Mines, has been made a member of the American Philosophical Society of Philadelphia in recognition of his services in "promoting useful knowledge."

MAX PHILLIPS, of the Color Laboratory of the Bureau of Chemistry, presented as an informal communication before the Washington Chemical Society, April 12, a brief outline of the indirect method that he has developed for making thymol from cymeme. The first method usually employed for making hydroxyl derivatives from hydrocarbons gives an isomer in this case, and therefore is not applicable. Phillips' method involves the following steps: Nitration, reduction to an amine, sulphonation, preparation of the azide, removal of this group, and then substitution of the hydroxyl for the sulphonic acid group, giving thymol as the product.

WILLIAM F. G. SWANN, professor of physics at the University of Minnesota, visited the Cryogenic Laboratory of the Bureau of Mines on April 19. Other visitors to the laboratory included Dr. J. W. MARDEN, of the Westinghouse Lamp Co., and Prof. W. A. NOYES, of the University of Illinois.

CLAUDE F. TEARS, of Star Lake, N. Y., formerly chemical engineer with the Texas Oil Co. in New York City, has recently accepted a similar position with the Universal Oil Production Co. of Chicago, Ill.

Sir JOSEPH JOHN THOMSON was guest of honor at a dinner at the Union League Club in Philadelphia on April 12.

E. G. WILMER, president of the Goodyear Tire & Rubber Co., Akron, Ohio, has been elected chairman of the board of directors and executive committee. G. M. STADELMAN, heretofore vice-president, has been elected president to succeed Mr. Wilmer.

# Obituary

JOHN J. HEROLD, late superintendent of the Ohio Pottery Co., died at his home in Zanesville, Ohio, on Wednesday, April 18. He had been in poor health for a number of years, and had not been active in business for several months. Mr. Herold was born 1871 in Carlsbad, Austria.

Dr. S. S. WHEELER, president of the Crocker-Wheeler Co., died suddenly of angina pectoris April 30 at his home in New York City.

# Society Calendar

AMERICAN ASSOCIATION OF CEREAL CHEMISTS will hold its ninth annual convention at Hotel Sherman, Chicago, June 4 to 9.

AMERICAN ASSOCIATION OF ENGINEERS will hold its annual convention in Norfolk, Va., May 7 to 9.

AMERICAN ELECTROCHEMICAL SOCIETY will hold its spring meeting May 3, 4 and 5, 1923, at the Commodore Hotel, New York.

AMERICAN ELECTROPLATERS SOCIETY will hold its eleventh annual meeting at Providence, R. I., July 2 to 5.

AMERICAN GAS ASSOCIATION will hold its annual convention the week of Oct. 15 at Atlantic City. An elaborate exhibition of gas-making and gas-utilization equipment is planned.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS will hold its summer meeting June 20-23 at Wilmington, Del.

AMERICAN LEATHER CHEMISTS ASSOCIATION will hold its twentieth annual convention at the Greenbrier, White Sulphur Springs, W. Va., June 7, 8 and 9.

AMERICAN OIL CHEMISTS' SOCIETY is holding its annual meeting at the Eastman Hotal, Hot Springs, Ark., April 30 and May 1.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS will hold its spring meeting May 28 to 31 in Montreal, Canada.

AMERICAN SOCIETY FOR TESTING MATERIALS will hold its twenty-sixth annual meeting at the Chalfonte-Haddon Hall Hotel, Atlantic City, beginning Monday, June 25, 1923, and ending either Friday or Saturday of that week.

AMERICAN ZINC INSTITUTE, INC., will hold its fifth annual meeting at the Hotel Chase, St. Louis, May 7 and 8.

CANADIAN INSTITUTE OF CHEMISTRY will hold its annual meeting in Toronto, May 29 to 31.

CHAMBER OF COMMERCE OF THE UNITED STATES will hold its eleventh annual meeting in New York May 7 to 11.

INTERSTATE COTTON SEED CRUSHERS ASSOCIATION will hold its annual convention at Hot Springs, Ark., May 2 to 4.

IRON AND STEEL INSTITUTE (London) will hold its annual meeting May 10 and 11 at the House of the Institution of Civil Engineers, London, S. W. 1.

NATIONAL ASSOCIATION OF MANUFACTURERS OF THE UNITED STATES OF AMERICA will meet in annual conference May 14 to 16, inclusive, at the Waldorf-Astoria, New York City.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH) will be held in New York Sept. 17-22.

NATIONAL FERTILIZER ASSOCIATION will hold its thirtieth annual convention at White Sulphur Springs, W. Va., the week of June 11.

NATIONAL FOREIGN TRADE COUNCIL will hold its annual conference May 2, 3 and 4 in New Orleans, La.

NATIONAL LIME ASSOCIATION will hold its fifth annual convention at the Hotel Commodore, New York City, June 13 to 15.

NATIONAL SYMPOSIUM ON COLLOID CHEMISTRY will be held at the University of Wisconsin, June 12 to 15.

NEW JERSEY CHEMICAL SOCIETY holds a meeting at Stetters Restaurant, 842 Broad St., Newark, N. J., the second Monday of every month.

PACIFIC DIVISION, American Association for the advancement of Science, will hold its seventh annual meeting at the University of Southern California, Los Angeles, Sept. 17 to 20, in conjunction with the summer session of the national association and a meeting of the Southwestern Division of the National Association.

SOCIETY OF CHEMICAL INDUSTRY, Canadian Section, will meet in Toronto, May 29 to 31.

SOCIETY FOR STEEL TREATING — Eastern sectional meeting will be held June 14 and 15, in Bethlehem, Pa.

The following meetings are scheduled to be held in Rumford Hall, Chemists' Club, East 41st St., New York City: May 4—American Chemical Society, regular meeting, May 11—Société de Chimie Industrielle (in charge) American Chemical Society, American Electrochemical Society, Society of Chemical Industry, joint meeting, May 18—Society of Chemical Industry, regular meeting. June 8 — American Chemical Society, regular meeting.

# Industry and Trade

*Current News and Market Developments*

*April* 30, 1923

CHEMICAL & METALLURGICAL ENGINEERING

Tenth Avenue at 36th Street, New York

H. C. PARMELEE, *Editor*

### News Section

| | |
|---|---|
| Washington News | 783 |
| Trade Brevities | 784 |
| Construction and Operation | 795 |
| Industrial Developments | 796 |
| New Companies | 796 |
| Industrial Finances | 796 |
| Foreign Trade Opportunities | 796 |

### Market Section

| | |
|---|---|
| Chemicals | 788 |
| Coal-Tar Products | 790 |
| Oils and Fats | 791 |
| Miscellaneous Products | 791 |
| Imports at the Port of New York | 792 |
| Current Prices in the New York Chemical Market | 793 |

## The Summary of the Week

Merger of the Archer-Daniels Linseed Co. and the Midland Linseed Products Co., was announced last week. The new company will have a larger linseed crushing capacity than any other company in the world.

Leading producers of prussiate of soda have announced lower prices for May deliveries, which in turn has weakened the spot market.

Formaldehyde has worked into a stronger position as the result of cleaning up resale lots which had depressed the market.

Declines in the metal markets has been reflected in prices for metal salts and practically all the latter are easier with an open decline of 2c. per lb. in the case of tin oxide.

Reports that phenol production will soon be increased have put a check on buying in speculative circles.

Potash company will conduct an educational campaign to stimulate the consumption of potash in the fertilizer trade.

China wood oil sold on spot at 40c. per lb., which is a new high for the movement and the highest price on record in our markets.

Arsenic continues to be one of the live spots in the chemical market, but prices are too high to interest buyers.

Southern Tariff Association and various farmers' organizations have protested against an investigation by Tariff Commission on duties on vegetable oils as applied for by organization representing soap and paint manufacturers.

The Treasury Department is preparing a list of standards of strength of coal-tar products as imported. prior to 1914. These standards will be used as a basis of assessing duties on present imports.

D. H. Blair, Commissioner of Internal Revenue, announces the names of the committee from the industrial alcohol industry to consult with and advise the Prohibition Unit.

## Expansion of English Chemical Industry

THE steady increase in production of chemicals in England is set forth in a report issued by H. B. Allin Smith, Assistant Trade Commissioner, from the office of the Commercial Attaché at London. This report states that English production of some heavy chemicals previously drawn from abroad is now under way and is expanding as plant and staff can be extended or precarious trade at the present time warrants. Calcium carbide plant is established, one by the British Carbide Factories, Ltd., with 2,000 tons capacity per annum, and another by the British Cellulose & Chemical Manufacturing Co., Ltd., at Spondon, capacity 40,000 tons yearly. The latter has an acetic acid plant also, but importations have been cheaper heretofore than local recovery from carbide.

The report further states that ammonium sulphate manufacture is developing through Brunner, Mond & Co. Their new Billingham factory, now under construction, for the recovery of atmospheric nitrogen, is to be fully operating this year, producing 100 tons of 100 per cent ammonia daily, or 150,000 tons of sulphate annually. A gradual extension to 300 tons is planned, equivalent to 450,000 tons of sulphate each year. The March *Chemistry and Industry* states that "in conjunction with a contact nitric acid plant, the Billingham factory goes far to diminish our dependence on Chilean saltpeter. It enables Britain to become an exporter of a bulk product of which we were formerly exporters."

Alkali and bleach are being made by the Greisheim Electron Co. and the United Alkali Co. Among heavy chemicals, the war production by the latter of dinitrophenol expanded its plant to a capacity of 100 tons weekly.

The growing British dyestuffs industry is an outlet for chlorine, made by the firm of Castner-Kellner and the United Alkali Co., Ltd.

A few words may be said about these more specialized branches of the industry, which of course cannot be divorced from the fundamental foundation of heavy chemical supplies. Britain is said to be making good progress in establishing these, through the governmental support provided by the dyestuffs act and the protective measure known as the safeguarding of industries act.

An estimate is made that, of fine chemicals, essences, perfumery and medicines, about 2½ tons is now made in Britain for every ton made before the war. W. & J. Bush & Co., Boots & Co. and others have led in research since protective measures have supported them. Aspirin, salicylic acid, saccharin, chloramine-T, novocaine and ethylenechlorhydrin are now British made.

Especially in dyestuffs have the chemical staffs and research facilities been broadened. It is said that fully 80 per cent of dyestuffs consumed in Britain today are wholly British made, compared with 10 per cent, or about 2,000 tons only, in 1914. Leaders in this business are the British Dyestuffs Corporation (with governmental connections), Read, Holliday & Sons, British Alizarine Co. and Clayton Aniline Co.

# Chemical Imports for 1922 Increased 24 Per Cent in Value

## Heavy Arrivals of Oxalic Acid in Last Quarter—Imports of Sodium Cyanide More Than Doubled—Falling Off in Coal-Tar Crudes

IMPORTS of chemicals during 1922 show a healthy gain in sympathy with the general trend of increased domestic industrial activity. Aggregate value of imports of chemicals and allied products for the year increased 24 per cent, from $80,763,600 in 1921 to $100,603,700 in 1922.

Owing to the incomparability of the individual commodities included under the main groups, only a very general idea of the trend can be procured from an analysis of the import and export statistics for the years 1921 and 1922. Of the groups for which any comparisons can be made, explosives, the group recording the most important expansion in exports (80 per cent), showed the smallest in imports (11 per cent). On the other hand our foreign shipments of paints, pigments and varnishes actually diminished 5 per cent while our receipts advanced 55 per cent. Fertilizers, another group of the exports having but a small gain (3 per cent), took a big jump in imports (47 per cent). Crude drugs and essential oils exceeded 1921 shipments by 10 per cent in value, while receipts swelled 42 per cent. Foreign sales of perfumery and cosmetics also were greater than foreign purchases of these articles, having gained 33 per cent, and imports, 28 per cent. Imports of medicinal and pharmaceutical preparations increased 23 per cent; exports but 11 per cent. The least change of all the groups was still in general chemicals (which includes coal-tar and heavy chemicals), and although the figures indicate a loss (4 per cent) in exports, they likewise show but a small gain (less than 3 per cent) in imports.

### Decrease in Coal Tars

The aggregate value of imports of all coal-tar chemicals decreased slightly, from $11,225,700 in 1921 to $11,012,800 in 1922. The total receipts of coal-tar crudes dropped 11 per cent, from $5,281,400 in 1921 to $4,740,400 in 1922, noticeable declines occurring in all the classes except in tar and pitch. Naphthalene fell 30 per cent in quantity and 60 per cent in value, from 4,495,800 lb. ($135,900) to 3,144,300 lb. ($54,000); dead or cresosote oil increased 25 per cent in quantity but decreased 10 per cent in value, figures for which are 33,239,400 gal. ($4,756,600) in 1921 and 41,567,500 gal. ($4,240,400) in 1922. The biggest reduction of this class was in benzene (90 per cent), which fell from 1,722,000 lb. ($42,370) to 172,500 lb. ($1,220); none was received from Sept. 22 to Oct. 31; 57,108 lb. ($381) arrived in November, and but 45 lb. ($8) in December.

Receipts of intermediates in 1922 surpassed those of 1921 by 867,300 lb. ($65,300); total receipts for the year 1922 were 2,136,700 lb. ($422,150). Arrivals of carbolic acid totaled 686,300 lb., valued at $102,300 in 1922. Were it possible to procure comparative figures for finished coal-tar products for the years under discussion it is believed that they would indicate, for the whole group, but a little change in tonnage. While slightly larger quantities of alizarin and derivatives, and colors, dyes, stains and color acids probably came in during the year 1922 than during 1921, on the other hand considerably smaller amounts of indigo, both natural and synthetic, and of coal-tar medicinals, were received. Alizarin and derivatives rose from 375,100 lb. ($510,000) in 1921 to 479,900 lb. ($701,900) in 1922.

### General Chemical Comparisons

Although the quantity of oxalic acid received during 1922 was 3 per cent in excess of that of 1921, the value was reduced approximately 30 per cent. It will be observed from a study of the following figures that the majority of the oxalic acid arrived since Sept. 22:

| | Lb. | Value |
|---|---|---|
| October | 324,319 | $24,564 |
| November | 460,514 | 44,117 |
| December | 488,950 | 56,723 |
| Total since Sept. 22 | 1,273,783 | 125,404 |
| Total for year | 1,294,236 | 127,757 |

There was 1,741,000 lb., $132,600, of arsenious acid or white arsenic; 112,700 lb., $40,450, of citric acid; 629,000 lb., $171,600, of tartaric acid, and 1,260,000 lb., $12,200, of sulphuric acid imported during the period Sept. 22 to Dec. 31, 1922. Imports of arsenic sulphide dropped in value but increased in quantity during 1922, figures for which are 6,686,600 lb., $531,300, in 1921, as compared with 7,630,500 lb., $472,000 in 1922.

Bleaching powder, one of the heavy chemicals recording the biggest advance in exports (123 per cent), showed a noticeable decrease in amounts imported—about 30 per cent. On the other hand, imports of glycerin advanced 30 per cent but exports only 20 per cent. Imports of crude iodine in 1922 failed to reach the 1921 level of 646,000 lb. ($1,430,600) by 294,000 lb. ($406,000) or nearly one-half of the total imports of 1921. Demand for citrate of lime during 1922 jumped over 1,000 per cent until a total of 15,982,000 lb. ($2,223,000) was reached. Receipts of potassium cyanide and potassium nitrate, crude and refined, in 1922, were below 1921, while those of other potassium compounds, carbonate, hydrate, hydroxide, bitartrate, and other potassium compounds, n.e.s., surpassed 1921. Sodium compounds also reflected an expansion, sodium cyanide more than doubling, from 8,708,000 lb., value $913,100, to 15,705,000 lb., value $1,306,000.

A noticeable feature of the trend of the import trade of fertilizers is the high percentages of gains in quantities but the much lower gains in values. The largest increases were in potassium sulphate (418 per cent in quantity and 237 per cent in value), and in manure salts (400 per cent in quantity and 153 per cent in value).

### Calendar

The following important technical meetings are scheduled for the immediate future:

INTERSTATE COTTON SEED CRUSHERS ASSN. Hot Springs, Ark., May 2-5
AMERICAN ELECTROCHEMICAL SOCIETY New York City, May 3-5
AMERICAN CHEMICAL SOCIETY Regular meeting, New York, May 4
AMERICAN ZINC INSTITUTE St. Louis, May 7-8
AMERICAN ASSN. OF ENGINEERS Norfolk, May 7-9
AMER. SOCIETY MECHANICAL ENGRS. Montreal, May 28-31
CANADIAN INSTITUTE OF CHEMISTRY Toronto, May 29-31
SOCIETY OF CHEMICAL INDUSTRY Canadian Section Toronto, May 29-31
AMER. ASSN. CEREAL CHEMISTS Chicago, June 4-9
AMER. LEATHER CHEMISTS ASSN. White Sulphur Springs, W. Va., June 7-9
NAT'L FERTILIZER ASSOCIATION White Sulphur Springs, W. Va., June 11-16
NATIONAL LIME ASSOCIATION New York City, June 13-15
SOCIETY FOR STEEL TREATING Eastern Sectional Meeting Bethlehem, Pa., June 14-15
AMER. INST. CHEMICAL ENGRS. Wilmington, Del., June 20-23
AMER. SOC. FOR TESTING MATERIALS Atlantic City, June 25-29

## Begin Nitrate Inquiry Soon

Selection of a chemist to have charge of the investigation of the Department of Commerce into the nitrate situation is expected to be announced soon. This will be part of the general inquiry to be made with regard to a number of products for which the United States is largely dependent upon imports.

The nitrate inquiry will include the advances of chemistry in the production of synthetic nitrate, from the standpoint of the economic results obtained rather than purely from the theoretical chemical point of view. The cost of production in Chile, the relative cost of synthetic production in the United States and actual or possible control of prices by foreign combinations will be looked into. Investigations also will be made in Germany. Possibilities of synthetic production at Muscle Shoals and at other suitable sites, by various methods, will be studied.

Preliminary steps have been taken for an investigation into tanning extracts, while the complete program will include inquiries into iodine, potash, quinine and other commodities.

# Washington News

## Move to Reconsider Duties on Oils Draws Protest

Vigorous protest has been voiced by the Southern Tariff Association and various farmers' organizations against an investigation by the Tariff Commission of duties on linseed oil, coconut oil, peanut oil, soya bean oil and other vegetable oils regarding which an application for reductions of 50 per cent in duties under the flexible tariff has been filed.

A delegation of ten called on the commission April 23 and a delegation of twenty visited the commission April 24 to register a protest against the application. The commission did not grant a formal hearing to the delegations, as under its rules hearings on applications are to be held only after a preliminary investigation of the application by the commission itself and a formal call for a hearing where all interested parties may appear, but the protestants met the commissioners individually and conferred with members of the commission's staff.

The application for a reduction in the duties was filed by the Bureau of Raw Materials for American vegetable oils and fats industries in the interest of soap and of paint and varnish manufacturers and of large consumers of these commodities.

Representatives of farmers' associations who protested against a formal investigation looking to changes in rates declared that financing of the crops would be made difficult were the duties to be thrown into a condition of uncertainty and that there would be a reduction in acreage.

The application has not passed through the preliminary stages of investigation and the action of the commission will not be determined until after a report is received from its advisory board, which is now considering the case.

## To Stimulate Use of Potash in Fertilizers

No stone will be left unturned by the Potash Importing Corporation of America when it begins its operations on May 1 to stimulate the use of potash fertilizers. An effort will be made to increase the percentage of potash in fertilizer mixtures. It is recognized in Germany that American consumption of potash must be restored to its pre-war volume if the industry in that country is to thrive.

The American corporation, which is understood to have been financed entirely in this country, will be the official distributing representative of the German syndicate. The objective of the corporation will be to increase potash consumption in the United States to the point where the potash taken out of the soil by crops is replaced each year. It is realized that this will have to be done gradually and that it carries with it an educational campaign, the object of which will be to convince the American farmer of the value of potash fertilizers.

## Strength Standards Adopted for Coal-Tar Imports

### List of About 100 Standards Prepared—Will Be Submitted to Trade for Criticism

The Treasury Department is preparing to issue in the immediate future a list of standards of strength of commercial imports of coal-tar dyes, chemical and other products as brought in before July 1, 1914.

A conference on this subject was held April 23 among Ernest W. Camp, director of the Customs Division; Dr. H. C. Knight, in charge of the customs laboratory at New York; Dr. Peter Feberger, dye specialist at the laboratory, and W. N. Watson, color specialist of the Chemical Division of the Tariff Commission.

The 1922 tariff act provides that coal-tar products shall be assessed for duty on the basis of the commercial strength of imports previous to July 1, 1914. Many dyes and other products are now imported in more concentrated form than previous to the outbreak of the war in Europe. In such cases the specific duty of 7 cents per pound will be multiplied in accordance with the increase in strength. The ad valorem duty naturally will not be affected.

Samples have been gathered from various sources by the customs laboratory in its investigations and a list of about 100 standards has been prepared, covering the bulk imports. No effort will be made to list each individual color or product, but the standards will be arranged by types.

The list will be submitted to the trade for criticism for about 10 days before it is officially promulgated.

## German Potash Industry Not Dependent on Ruhr Coal

The German potash industry is not dependent upon Ruhr coal. In January of 1922 more than 97 per cent of its fuel requirements were met with brown coal. At the time of the entry of France into the Ruhr, a slightly larger percentage of black coal was being used, but it was less than 5 per cent of total requirements. Such black coal as is needed for operating the railways belonging to the industry and its blacksmith forges can be supplanted easily by imported coal. There is, however, some black coal production on the properties of the potash companies. It happens that brown coal is so distributed in Germany as to be the logical fuel for the potash works.

## Alcohol Committee Named

### Commissioner Blair Makes Known List of Men Who Will Consult With Internal Revenue Bureau

Appointment of an advisory committee representing various phases of the industrial alcohol industry to consult with officials of the Internal Revenue Bureau and the Prohibition Unit regarding regulations and practices affecting the industry has been announced by D. H. Blair, Commissioner of Internal Revenue.

The organization of this committee is the result of a conference with the commissioner held several weeks ago by representatives of various organizations of producers, distributors and consumers of industrial alcohol, who asked that a special division to handle such matters be created, separate from the Prohibition Unit, or that an advisory committee be named. Attention was called by this delegation to the fact that the legitimate needs of industrial alcohol have been submerged beneath exercise of the police powers to suppress liquor violations, whereas the Volstead act provides for encouragement of the proper use of industrial alcohol.

The committee will consult with Commissioner Blair and with Prohibition Commissioner R. A. Haynes before any regulations affecting industrial alcohol are issued, and will give advice regarding means of facilitating legitimate use of the product.

Members of the committee named by Commissioner Blair are:

Dr. H. E. Howe, Washington, D. C., editor of the *Journal of Industrial and Engineering Chemistry*, representing the American Chemical Society.

William A. Sailor, Baltimore, president of Sharpe & Dohme and president of the American Drug Manufacturers Association.

E. J. Schieffelin, New York City, representing the National Wholesale Druggists Association.

Samuel C. Henry, Chicago, representing the National Association of Retail Druggists.

Prof. J. H. Neal, University of Illinois, Urbana, representing the American Pharmaceutical Association and the faculties of pharmaceutical colleges.

Martin Ittner, chief chemist, Colgate & Co., Jersey City, N. J., representing the American Manufacturers of Toilet Articles.

Frank A. Blair, New York City, president of the Proprietory Association.

M. C. Whitaker, New York City, president of the U. S. Industrial Chemical Co.

R. H. Bond, Baltimore, manager, McCormick & Co., representing the Flavoring Extract Manufacturers Association.

Charles L. Reese, chemical director, E. I. du Pont de Nemours & Co., president of the Manufacturing Chemists' Association.

# U. S. Largest Producer and Consumer Of Rosin and Turpentine

## How Consuming Demand Is Divided According to Trades—Exports Below Standards of Pre-War Years

AN investigation into the turpentine and rosin industries has recently been completed by V. E. Grotlisch, of the Bureau of Chemistry. This report states that the United States furnishes between 60 and 65 per cent of the world's supply of turpentine and from 70 to 75 per cent of the world's rosin. The principal reason for the difference between the two is the fact that in Russia, Finland, Sweden, Norway and Poland wood turpentine is produced chiefly by the destructive distillation of wood, in which process no rosin is recovered. In Sweden a so-called turpentine and a so-called liquid rosin are recovered as byproducts in the manufacture of paper pulp. A relatively small quantity of so called spruce turpentine is recovered at several paper mills in this country.

The United States not only produces most of the world's turpentine and rosin but also uses a larger part of it than any other country. Roughly, it consumes between 35 and 40 per cent of the total world supply of turpentine and about 30 per cent of the rosin. As indicated by recent data collected by the Bureau of Chemistry, this consumption is distributed approximately as follows:

| | Per Cent |
|---|---|
| Turpentine: | |
| Paint and varnish industry | 45 |
| Shoe, floor and other polishes | 6 |
| Automobiles, wagons, cars, etc. (painting) | 3 |
| Medicinal and pharmaceutical preparations | 2 |
| Other industrial uses | 4 |
| For thinning down paint and varnish, and other miscellaneous purposes | 40 |
| Rosin: | |
| Soap making | 42 |
| Paper and paper sizing | 25 |
| Paint and varnish | 17 |
| Rosin oil, pitch and printing ink | 6 |
| Linoleum and similar coverings | 3 |
| All other uses | 7 |

In England, at present the second largest consumer of naval stores, the distribution of consumption is probably similar to that of the United States.

Exports of turpentine have shown decided increases since the war, the average for 1919 and 1920 being more than 10,000,000 gal. On the other hand, the average exports of rosin for 1919 and 1920 were 665,000 round barrels less than they were during the war. For the calendar year 1921 there were exported 9,267,959 gal. of turpentine and 560,864 round barrels of rosin, which, deducted form a total production of approximately 24,751,000 gal. and 1,684,000 round barrels, respectively, left for domestic purposes about 15,483,000 gal. of turpentine and 1,123,000 round barrels of rosin. In 1922 there were exported approximately 9,864,000 gal. of turpentine, including 495,000 gal. of wood turpentine, and 799,000 bbl. of rosin.

The exports of naval stores from the United States to Belgium, Germany, Holland and Italy in 1921 showed a decided increase, which, however, was offset by a decrease in the exports to most of the other countries listed, particularly Great Britain and the South American countries. In 1922, on the other hand, exports of turpentine to Belgium, Germany and Holland again decreased, but there was a corresponding increase in the exports to the rest of the world. Argentina, Australia and Japan were the only important countries importing American rosin which took less in 1922 than in 1921. Exports to the rest of the world showed a decided increase.

The increase since the outbreak of the war in American exports of rosin to the Scandinavian countries is interesting. This is due not only to an increase in their consumption of this commodity but also to a decrease in their importations from Germany, and, to a less extent, from Holland and Belgium. In other words, the Scandinavian countries are buying more of their American-made naval stores in the United States instead of second hand from German dealers in Hamburg and Bremen and Belgian and Dutch dealers in Antwerp and Rotterdam. A large proportion of the naval stores imported from the United States by Belgium and Holland are re-exported into Germany, passing through Rotterdam and Antwerp, whence it is shipped by river and canal to the German manufacturing districts in the Rhine Valley.

## Linseed Companies Merge

Announcement was made last week that plans had been completed for the consolidation of the Archer-Daniels Linseed Co. and the Midland Linseed Products Co. J. W. Daniels, president of the Archer-Daniels Linseed Co., will serve as president for the new company and in general the management of the latter will be in the hands of the present officials of the Archer-Daniels Linseed Co. E. C. Warner, president of the Midland Linseed Products Co., will retire.

## Bakelite Phenol Production Soon Available

The Bakelite Corporation of New York is erecting a plant for the manufacture of phenol near Cleveland, Ohio, and expects to be in a position to produce a surplus beyond its own needs, which will be available in a short time at as moderate prices as conditions will permit. According to an announcement made last week the phenol enterprise is the direct result of the protection afforded by the new tariff.

## Trade Notes

Parsons & Petit, 63 Beaver St., New York, have issued a card on the subject of nitrate of soda. Statistical figures showing production and world's consumption, together with prices for a period of years, make this chart interesting and valuable to the trade.

It is reported that the California Cyanide Co., which is a subsidiary of the Air Reduction Co., will start producing cyanide and hydrocyanic acid in its California plant by Aug. 1.

Dr. Frank J. Monaghan, Health Commissioner of New York City, has set aside the week beginning May 7 as Paint-Up and Clean-Up Week for the city.

Advertising soap as "medicated" or as being made for or by a "medical association" when such statements are not true is declared by the Federal Trade Commission to be an unfair business act. The commission has therefore issued a cease and desist order directed to the Williams Soap Co., of Indianapolis, Ind.

W. D. Schwartz, of the L. H. Butcher Co., New York and San Francisco, accompanied by Mrs. Schwartz, sailed on the S.S. "Majestic," April 21, for England and the Continent. He will visit principals and factories in nine countries, for whom his company acts as sales agent for colors, minerals and chemicals.

Inquiries are being received in this country from German sources for prices on Chilean saltpeter. No explanation has been forthcoming as to why reputable German firms should be interested in making nitrate purchases in this country.

The rate on sulphate of ammonia from Seaboard, N. J., to New York, for export, is not unreasonable or otherwise unlawful, the Interstate Commerce Commission has ruled in connection with a case brought by the Seaboard Byproduct Coke Co. against the Delaware, Lackawanna & Western R.R.

B. H. Handy, assistant sales manager, Semet-Solvay, Syracuse, N. Y., was in New York last week.

C. W. Nichols, president of the Nichols Copper Co., has resigned the office of vice-president of the General Chemical Co.

The Oil Trades Association of New York held an informal luncheon at Angelo's restaurant on Thursday, April 26. Dennis E. Bergen, president, presided.

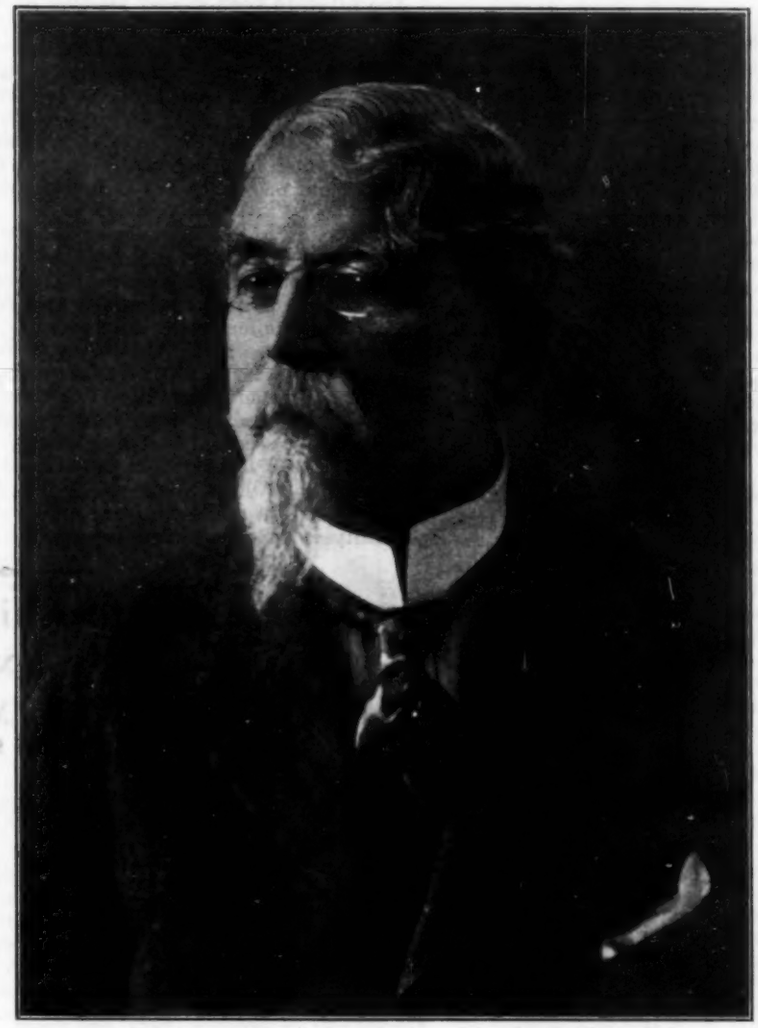
F. D. Lockwood, dealer in chemicals and oils, 115 Broadway, has been in Baltimore on a business trip.

E. F. Drew & Co., dealers in chemicals, will move their offices on April 30 to the Barrett Building, 40 Rector St.

H. H. Dow, president of the Dow Chemical Co., Midland, Mich., was in New York last week.

# George W. Fortmeyer

*Vice-president of the National Lead Co., who has served in the white lead industry for sixty-seven years, is honored by his co-workers on his eighty-fourth birthday.*



THURSDAY, April 20, was the occasion of a celebration in honor of one of the best known and most highly regarded members of the white lead industry. It was the eighty-fourth birthday of George W. Fortmeyer, vice-president of the National Lead Co. and general manager of the Atlantic branch of the company. During the course of the day Mr. Fortmeyer was called to the office of President Cornish and on his return he found his own office thronged with officials and employees of the company who had assembled to celebrate the day and to honor their associate and leader.

A. C. Saunders, cashier of the company and a veteran of many years in the "National" employ, in a very fitting speech presented Mr. Fortmeyer with an oil painting of himself, done by Frank B. McCarthy, of the sales force of the company. Mr. Fortmeyer was visibly affected by the gift and by the many congratulations which he received from his co-workers. He expressed his thanks in a brief speech in which he took occasion to pay tribute to the spirit of harmony and co-operation that prevails among the workers in the Atlantic branch. Mr. McCarthy also spoke briefly and came in for much praise because of the excellent likeness of Mr. Fortmeyer which he had transferred to canvas.

Mr. Fortmeyer was born in New York and when a very young man he became associated with Colgate & Co. From that time up to the present has been identified with the white lead and linseed oil industries, until he has amassed the enviable record of 67 active years in those lines. As Mr. Saunders said in his presentation speech, Mr. Fortmeyer is more like 48 than 84, since he is very active physically and in addition to the manifold duties of his position, still finds time to devote to outside activities.

In the latter part of last year Mr. Fortmeyer completed his thirteenth year as president of the Linseed Association of New York and was re-elected for the ensuing year. Mr. Fortmeyer was one of the founders of this association and he played a prominent part in bringing it to the high plane of efficiency which it now enjoys. At the last annual meeting of the association, when Mr. Fortmeyer was re-elected to the presidency, a valuable gift was presented to him by the members and on different occasions they have paid tribute to the esteem in which they hold him and to the work he has done to make the association a recognized authority in the markets of the world.

Although he is now an honorary member of the Paint, Oil and Varnish Club of New York, Mr. Fortmeyer's activities for many years made him one of the most prominent members of that organization. He was president of the club in 1895-1896 and served on various important committees in later years.

## New Chemistry Course on Commercial Subjects

**University of Wisconsin Stresses Economic Phases of Chemical Industry in Studies to Start This Fall**

A new course, called the "chemistry-commerce course," is to be launched at the University of Wisconsin this fall. Its purpose is to meet the requirements of men who wish to fit themselves for commercial positions in the chemical and related industries. The growing importance of chemistry in commerce has led to this step. The idea is to combine sound training in various branches of economics with several courses in chemistry. The chemical training is planned mainly to give a man sufficient knowledge to understand the basic technical features of the industries with which he may come in contact.

In the course in commercial chemistry, which runs throughout the junior year, only so much of the technical side will be presented as is necessary for a background. Emphasis is to be placed on the economic or commercial aspect. It is the expressed intention to give a student a wide acquaintance with commercial processes and materials of commerce rather than a detailed technical knowledge of a few. For those who desire more technical treatment, courses in industrial chemistry will be open as electives. Such problems as those of plant location and transportation will be especially studied. Another feature is to be a study of market reports and analysis of the factors causing fluctuations in the price of materials in the chemical markets.

Besides the broad range of economic subjects covered, embracing in all fourteen courses, the curriculum includes several in mathematics, foreign languages and English. In addition, a number of electives have been provided in order that a student may broaden his education in the direction he chooses.

## H. D. Ruhm Named to Head New York Paint Club

The committee on nominations, of which H. J. Schnell is chairman, will submit the following names for election at the May meeting of the Paint, Oil & Varnish Club of New York: President, H. D. Ruhm; vice-president, C. J. Roh; secretary, H. G. Sidebottom, and treasurer, G. H. Tomlinson. Executive committee: E. V. Peters, chairman; A. G. Fairweather, R. W. Murray, H. G. Sidford, A. L. Somers and Frank Waldo. The arbitration committee proposed by the committee consists of G. W. Fortmeyer, chairman, D. E. Breinig, J. B. Bouch, Jr., H. Gates and Eugene Merz. R. O. Walker will head the twenty-six delegates that will be chosen to represent the New York organization at the national convention next October.

## June A.I.C.E. Meeting to Be Held at Wilmington, Del.

The fifteenth semi-annual meeting of the American Institute of Chemical Engineers is to be held June 20 to 23 at Wilmington, Del. The headquarters for the meeting is to be the Hotel Dupont, where about 150 guests are expected. Each day of the meeting includes in its program the reading of technical papers, plant inspection and some social activity.

The papers to be presented, about twenty-three in number, embrace a wide range of interesting subjects. The papers on decolorizing materials, char, silica gel and fullers earth and those on corrosion promise to be noteworthy.

Among the plants to be visited are those of the Bond Bottle Seal Co., the American Vulcanized Fiber Co., the Bancroft Co. (cotton finishing), the Electric Hose & Rubber Co. and several departments of E. I. du Pont de Nemours & Co. In the latter plant an opportunity is to be afforded to see the Jackson laboratory, probably the most famous color laboratory in the world.

Social activities have not been neglected in the preliminary arrangements. A general social gathering, golf and an automobile trip to Pierre S. du Pont's residence at Longwood have been provided. At Mr. du Pont's home there is to be a garden party, a visit to the conservatories and dinner.

## Chemical Trade Commissioner Urged for Germany

The Department of Commerce has under consideration the addition to its staff of trade commissioners in Berlin of an economist especially experienced in chemicals. It has practically been decided to expand in this direction if a man of proper qualifications can be secured. Domestic producers of dyes and chemicals have urged the department recently to secure more reports on conditions in the industry in Germany. If the suggestion is adopted, the agent will operate from Berlin.

## Chemicals and Allied Products Show Gains in Export Trade

**Statistical Review of Export Movement for 8-Month Period Ended Feb. 28**

A GAIN of 19 per cent was made in the exports of chemicals and allied products for the 8 months July 1, 1922, to Feb. 28, 1923, as compared with July 1, 1921, to Feb. 28, 1922. Foreign sales for the months of January and February, 1923, represented expansions of 14 and 19 per cent respectively over the corresponding months of 1922, rising from $9,685,359 in January, 1922, to $10,944,830 in January, 1923, and from $8,692,116 in February, 1922, to $10,374,895 in February, 1923. One noticeable feature in the February trade, 1923, is a loss of 5 per cent from the January trade, although this may be partly accounted for by the difference of 3 days in the length of the months. The aggregate value of the groups and commodities with the percentages of increase or decrease for the 8 months, July 1, 1921, to Feb. 28, 1922, as compared with July 1, 1922, to Feb. 28, 1923, were:

Under the first group, "chemicals and allied products," are included coal-tar products (which expanded 44 per cent in value), medicinal and pharmaceutical preparations (24 per cent in value), acids and heavy chemicals, sodium compounds (26 per cent in value), pigments, paints and varnishes (32 per cent in value), fertilizers (1 per cent increase in quantity, but 8 per cent decrease in value), explosives (55 per cent in quantity and 38 per cent in value), perfumery, cosmetics and toilet preparations (34 per cent in value) and pyroxylin products (62 per cent in value). All future analyses of imports and exports will be based on this grouping. Soaps of all kinds and tanning materials and extracts are excluded.

Decrease occurred in the exports of formaldehyde, glycerin, soda ash, sal soda, ammonium sulphate and phosphate rock except the high-grade hard rock.

| | July 1, 1921-Feb. 28, 1922 | July 1, 1922-Feb. 28, 1923 | Per Cent of Increase or Decrease |
|---|---|---|---|
| Chemicals and allied products | $51,842,166 | $58,305,753 | 12 |
| Naval stores, gums and resins | 9,642,219 | 14,222,046 | 48 |
| Crude drugs, roots, etc. | 461,252 | 605,071 | 31 |
| Ginseng | 1,227,093 | 2,083,306 | 70 |
| Peppermint oil | 219,132 | 199,417 | —9 |
| Other essential oils | 335,323 | 371,941 | 14 |
| Logwood extract | 393,301 | 247,298 | —37 |
| Other vegetable dye extracts | 369,325 | 264,067 | —33 |
| Sulphur or brimstone | 3,461,447 | 4,437,676 | 28 |
| Sulphur, refined | 20,146 | 84,314 | 318 |
| Metal polishes | 200,710 | 208,175 | 4 |
| Linseed oil | 196,330 | 281,284 | 28 |
| Bones, hoofs, etc. | 71,711 | 172,024 | 140 |
| Glue of animal origin | 205,329 | 302,114 | 47 |
| Glue of vegetable origin | 13,704 | 46,288 | 238 |
| Gelatin | 20,308 | 132,561 | 552 |
| Beeswax | 12,766 | 17,689 | 37 |
| Wax manufactures | 248,859 | 243,573 | —2 |
| Matches | 168,774 | 157,258 | —7 |
| Total | $69,300,925 | $83,340,825 | 19 |

## Government to Investigate Production Costs Abroad

C. R. DeLong, chief of the Chemical Section of the Tariff Commission; M. G. Donk, a chemical expert of the section, and Eben M. Whitcomb, one of the commission's accountants, will sail for Europe May 3 to investigate costs of production abroad of various chemicals regarding which applications for changes in duties under the flexible tariff section have been docketed.

The party plans to spend 3 weeks in England investigating barium dioxide and potassium chlorate. Their subsequent schedule calls for 2 weeks in Norway investigating sodium nitrite; 6 weeks in Germany investigating various chemicals, and later trips to Holland on oxalic acid and to Switzerland on barbituric acid. This schedule is tentative as to the time in each country.

Mr. DeLong will leave the party in Germany and make a trip of inspection through France and probably other countries on the Continent. He will return after 2 months abroad. Other members of the Chemical Section staff will embark in June and join the original party. The total schedule of work for the chemists in Europe cannot be completed before the middle of August, it is estimated, and may be extended by the addition of other investigations while they are abroad.

## Equipment Statistics to Be Gathered Monthly

A new statistics service in the chemical industries has been inaugurated by the Chemical Equipment Association. Data are to be gathered through the co-operative efforts of members of this organization, representing manufacturers of equipment and materials in practically every field. This will embrace industries which are strictly chemical or metallurgical in nature as well as a great many which are related to these.

According to a statement made by P. D. Schenck, president of the association, following a recent consideration of statistical activities by the board of directors, "Chemical equipment is in effect a barometric register of general industrial conditions both at home and abroad. In many ways the absorption of chemical equipment and materials is as reliable and specialized an index to general industrial conditions as the production of pig iron was considered to be before the war, or as the Federal Reserve Bank's discount rates are now regarded.

"It is not yet generally realized that the membership of the Chemical Equipment Association, now recognized by the government and by industry in general as the speaking voice of American chemical equipment and materials manufacture, supplies essential equipment to practically every basic industry in the United States and abroad. There is scarcely an article of common consumption, in diet, in clothing, in transport, in the essentials or semi-essential accessories of life, that is not produced in some degree through the use of standard or special equipment and materials manufactured by the membership of this association."

The collection of comparative statistics on the absorption of chemical equipment and materials by industries and by sections is to be a monthly activity. By industries, the information collected each month discloses the manufacturing fields most active in the absorption of equipment and materials, both as to domestic absorption and as to foreign absorption. By geographical sections of the United States, the information also discloses the principal concentrations of industrial activity in the way of replacements, in factories, new construction operations and expansion projects of various sorts. The information further reveals general trade and business conditions of other sorts than those strictly pertaining to the absorption of chemical equipment.

## News Notes

**A unique celebration** is to be held in France on May 27, to be known as "Laboratory Day." The occasion is that of the centenary of the birth of Pasteur. Research laboratories and research workers are to profit from contributions received on that day.

**Reduction of wasteful variety** in manufactured goods is being sought with considerable success by the U. S. Chamber of Commerce. Paper, rubber, leather and fabricated iron, as in pipe and agricultural implements, are the industries in which results have been accomplished. For instance, certain paper makers report a cut to 55 per cent of former lines, with consequent increased production at lower cost.

**Synthetic camphor production** by a new process is to be begun at Feugen, Austria, in the near future. The Chamber of Commerce of Vienna has confirmed a report to this effect. Anton Gawalowski of Feugen is the inventor of the new process.

**Desulphurization of coke** by steam is one of four important research problems being carried on at Carnegie Institute of Technology. The Bureau of Mines is co-operating in this work, which also includes a study of the correlation of the coal beds of western Pennsylvania through their microscopic constituents. The two other studies involve fundamental research on the corrosion of alloys and an investigation of low-temperature Pennsylvania coal tars.

**Fertilizer men** who are to meet at the convention of the National Fertilizer Association at White Sulphur Springs, W. Va., June 11 to 17 are arranging an extensive program. The subjects covered will include cost accounting systems, chemical and manufacturing problems, sales methods, transportation problems, etc. The officers of the association are now arranging the details and promise a meeting which will be of unusual interest to everyone identified with the fertilizer industry.

**Viscosity of cellulose** as determined by the cuprammonium method is being investigated by the Cellulose Division of the A.C.S. All firms or individuals having constructive information dealing in any way with the subject are urged to communicate with E. B. Benger, chairman, E. I. du Pont de Nemours & Co., Newburgh, N. Y.

**"Dyewood Products"** and "Early Chemical Symbols" were the two topics discussed at the April 23 meeting of the Stamford Chemical Society. R. H. Wisdom and E. H. Smith were the respective speakers.

**Ceramic engineering** will be taught at the Georgia School of Technology if the project now under way is consummated. The ceramic industries of the state are interested in the founding of the new course, for which a fund of $26,000 is sought. The idea of the new institution is to develop the clay resources of the state in a comprehensive and intelligent manner.

**Five fellowships** in the school of mines, University of Alabama, are to be offered during the school year 1923-24. The work, which will be done in conjunction with the U. S. Bureau of Mines, has been divided into two sections. One deals with the beneficiation of various iron ores, the other with problems of coal washing.

**American oil chemists** meeting at Hot Springs, Ark., April 30 and May 1 have arranged two very busy days. Besides the usual committee reports, seven technical papers are slated for the occasion.

**Ethylene as an anesthetic** for general use possesses superior properties, according to Dr. W. E. Brown, who has used it in a Toronto hospital. Mixed with nitrous oxide and oxygen it produces partial analgesia, or loss of pain, without loss of consciousness.

**Multiple unit cars** used for the transportation of chlorine gas cannot be classed as tank cars, according to C. F. Gerry, in a report submitted in the case of the Mathieson Alkali Works. This means that present freight charges are regarded as fair by the Interstate Commerce Commission.

**Synthetic ammonia** is to be produced in Spain by the Claude process, according to a recent Reuter dispatch. M. G. Claude is installing a factory there for a Spanish syndicate. The original plant is designed to use from 3,000 to 4,000 cu.m. of hydrogen a day—the output of the nearby electrolytic soda plant of the Electroquimica de Felix Co.

**Swiss carbide plants** having a yearly capacity of close to 120,000 tons are being closed down. Since only about 10,000 tons is used annually within the country, the present export crisis is affecting the industry vitally. The cement industry is likewise hard hit due to the present high price of coal and to its dependence on export markets.

Facts and Figures That Influence Trade in Chemical Products

# Market Conditions

Current Prices
Imports and Exports
The Trend of Business

## Domestic Buying Movement in Chemicals Has Become Less Active

### Good Export Inquiry Continues for Some Selections—Higher Producing Costs Strengthen Acetone and Acetate of Lime—Tin Oxide Reduced in Price—Lower Prices for May Deliveries of Prussiate of Soda

REPORTS of a slowing up in buying were prevalent throughout the week. This was especially true of buying for domestic consumption. In several cases the decline in activity is due to the fact that consuming trades are well covered for nearby wants. In other cases lessened activity in the trades is responsible for their absence from the materials markets. The fertilizer chemicals have passed their active season and no active buying is to be expected. Reports from the rubber trade say that a drop in tire production is in contemplation to obviate a sharp decline at the middle of the year. Reports from the tanning trade state that April business was not so good as that of March and a report from Milwaukee says that tanning plants are running only about 50 to 60 per cent of capacity.

#### Export Buying Holds Up

The movement of alkalis into export channels is holding up well and considerable business is being placed in the case of many heavy chemicals. From statistics made public last week it is seen that caustic soda is being shipped to a large number of foreign markets. Total shipments of caustic soda to foreign countries during February were 7,405,064 lb. of which 5,022,031 lb. went to Argentina, Canada, Brazil, Cuba and Japan, these countries being named in their relative position according to quantities taken by them. The value of export shipments in February figures out at slightly in excess of 3.40c. per lb., according to declared valuations.

#### Price Changes

There was no decided price movement during the period. Chemicals depending on wood distillation were stronger under higher producing costs. Lessened competition helped to firm up other quotations, notably bichromates, oxalic acid, and formaldehyde. Lower selling prices for metals have taken the edge off most of the metal salts and some of the latter are openly quoted at lower figures. Prussiate of soda was easier due to lack of buying and selling pressure on the part of holders. Arsenic, which is one of the most interesting items at present, failed to show any new developments and buyers are holding off evidently with the hope of covering their needs later on at more attractive price levels. Copper sulphate is weakened both by declines in the metal and by heavy offerings of imported grades at relatively low prices.

#### Acids

**Acetic Acid**—Higher costs for raw materials have been the feature of this market. A very strong undertone existed and the outlook is regarded as favoring a higher price level for a long time to come. There is very little competition from resale lots and the present price schedule is firm at $3.17½ for 28 per cent, $6.35 for 56 per cent and $12.05@$12.85 for glacial.

**Citric Acid**—Inquiry has continued fairly active but actual business has been restricted by the scarcity of stocks. Domestic makers are well sold ahead and are shipping out regularly on old contracts. They are holding prices steady and apparently are not trying to take advantage of the differential held by imported offerings. Prices are given at 49c. per lb., although it is admitted that this price is largely nominal for prompt deliveries. Imported holds at 52@53c. per lb. with shipments in some cases quoted above that level.

**Gallic Acid**—There is no indication of price changes for this acid. Sellers say values are established on a steady basis. Trading is along quiet lines with nothing to disturb routine conditions. Technical grades are quoted at 45@50c. per lb.

**Hydrofluoric Acid**—Consuming interest is not pronounced and while fundamental conditions are strong, producers are not inclined to advance prices in the slow season and continue to offer on a basis of 7@8c. for 30 per cent and 11@12c. for 48 per cent.

**Oxalic Acid**—A few odd lots were offered in the spot market at 13¼c. per lb. and even late in the week there were reports that 13¼c. could be done on a firm bid. Yet there seems good evidence that spot goods have been well depleted and the general asking price is 13¼c. as an inside figure with an upward range according to seller. Reduced offerings of imported both on spot and for shipment have strengthened prices for domestic and 13c. is held as an inside price for round lots at the works. At present there is no competition in domestic oxalic but a new producer is expected to begin offering next month.

**Sulphuric Acid**—Limited stocks in the possession of first and second hands give a firm appearance to prompt deliveries and in many quarters prices are given as nominal due to inability to take on new business for spot and nearby deliveries. Prices quoted are $9.50@$11 for 60 deg. in tanks and $16@$16.50 for 66 deg.

**Tartaric Acid**—Reports on the activity of the market vary. Some sellers say that consumers bought freely in anticipation of higher prices and are now well covered for considerable periods ahead. Other reports say inquiry remains good. Reports agree that values are firm and holdings limited. Asking prices are 36c. per lb. for both domestic and imported.

#### Potashes

**Bichromate of Potash**—While demand during the week was quiet, stocks in sellers' hands are reported to have been reduced by recent deliveries and sellers are competing less keenly for business. Prices now range from 10¾c. to 11c. per lb. at the works.

**Caustic Potash**—A quiet market ruled throughout the period. Buyers are interested only when prices are in their favor and there was a lack of shading in the spot market with imported 88-92 per cent quoted at 8¼@8½c. per lb., and the inside figure applying on shipments. The price of domestic makers is maintained at 8½c. per lb. carlots at the works.

**Muriate of Potash**—Advices from Germany state that higher price schedules are to be put into effect on May shipments. The influence of these reports in domestic markets is lessened by free offerings of Alsatian muriate and prices at present are by no means

### "Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

| | |
|---|---|
| This week | 179.23 |
| Last week | 178.31 |
| April, 1918 (high) | 286.00 |
| April, 1919 | 231.00 |
| April, 1920 | 261.00 |
| April, 1921 (low) | 140.00 |
| April, 1922 | 158.00 |

The firmer position of sulphuric acid is reflected in the advance of 92 points in the weekly index number. Copper sulphate was lowered but as the decline was moderate the price change had no important bearing on the general situation.

firm. While quotations of $35 per ton are given as representing the market it is an open secret that this price is being shaded materially in actual transactions.

**Nitrate of Potash**—The market for saltpeter has been gaining in strength and an advance of one-half cent per lb. was announced by leading sellers in the past week. For a long time imported material has been underselling domestic makes and kept selling prices for the latter at close to production cost. Recently imports began to decline and with diminished competition the domestic market has moved up to a position more favorable for sellers.

**Permanganate of Potash**—Prices have been very irregular with conflicting views held by sellers. Shipments were not quoted as freely as a week ago. Spot goods are reported to have sold at 23c. per lb., but this is far from a general quotation, as 23½@24c. is held by many sellers and stocks afloat were generally held at 23c. per lb. It is evident that prices depend on seller with no decided price trend in either direction.

### Sodas

**Bichromate of Soda**—Contract orders take up enough of production to prevent selling pressure and even concessions in order to equalize freight rates are now seldom met with. Prices at the works are firm at 7½@7¾c. per lb. for round lots with up to 8c. per lb. asked for smaller amounts. Spot stocks also are not present for sale and the local market is represented by quotations of 7¾@8c. per lb.

**Caustic Soda**—Export inquiry remains prominent and considerable amounts have been sold for May shipment. Standard brands are generally quoted at 3.45c. per lb. f.a.s. but sales are said to have been made at 3.40c. per lb. f.a.s. and outside brands have sold at 3.35c. per lb. with intimations that 3.30c. could be done for the last half of May. Home demand is less active as the majority of consumers are covered. Prices for standard goods hold at 2½c. per lb. for carlots at the works, basis 60 per cent.

**Chlorate of Soda**—Seasonable buying is holding the market in a steady position. Imported material holds at 6½c. per lb. and upward on a quantity basis. Prices of domestic producers are unchanged at 6½c. per lb. at works. New business is not heavy and no price disturbances are looked for from that direction.

**Cyanide of Soda**—Cyanide is said to have found a greater outlet this season in the color trade as a substitute for prussiates and demand from that source is still noted. The market is barely steady, as general consuming demand is not active and imported grades are competing and undoubtedly the latter would be more of a factor if consumers were convinced of their quality. Prices are 20@21c. per lb. for imported and 22½@23c. per lb. for domestic.

**Nitrate of Soda**—A fair amount of business is being done in spot and prompt delivery, but futures are not attracting attention in spite of quotations for later shipments at prices under those ruling for spot goods. Spot prices vary according to seller and if resale lots are taken into consideration the range may be given as $2.60 to $2.65 per 100 lb. On futures as low as $2.50 per 100 lb. has been quoted.

**Prussiate of Soda**—A sale of 5 tons of yellow prussiate on spot was reported at 18c. per lb. The market has been easy, however. In the first place demand has been very slow and holders of stocks have been forced to cut prices in order to move holdings. In the second place some large producers have announced prices of 17½c. per lb. works, on round lots for May shipment.

### Miscellaneous

**Acetate of Lime**—Higher producing costs have resulted in an advance of one-half cent per lb. for this material. Producers say that raw material and labor costs made it impossible to continue former quotations and they are now asking 4@4.05c. per lb. Demand is good especially on the part of domestic buyers.

**Acetone**—Following the lead of acetate of lime a stronger market exists for acetone and prominent factors have marked up their prices to 24½c. per lb. at works, which is equivalent to a delivered price, New York, of 25c. per lb.

**Arsenic**—Inquiry is persistent, but most buyers are bidding at levels which are too low to effect sales. Reports on asking prices are irregular, as quotations of 12½c. per lb. for shipments are heard, whereas bids at that figure have gone unfilled. In fact some sellers say they can place large amounts at 13c. per lb. but can find no reliable offerings at that level for any nearby positions. The spot market is quiet as far as sales go, with 15½c. per lb. as the prevailing asking price. Reports on increased production are having some effect on buyers. Based on production for the first quarter of the year, the domestic output for 1923 is estimated to reach a total of 22,000 tons of refined white arsenic.

**Copper Sulphate**—Prices for domestic makes are none too steady as a result of lower prices for the metal and because of continued weakness in imported. Demand has been slowed up by the downward trend of values, although contract deliveries are said to be ordered out promptly. There is no fixed quotation for imported sulphate on spot or for shipment. Sales are going through on firm bids and at different levels. Spot material can be picked up at 5½c. per lb. and possibly less and shipments have been offered under the 5½c. level. Standard makes of domestic are more firmly held, but some reports credit sales at 6c. per lb. and up to 6¼c. per lb. is asked.

**Formaldehyde**—A few odd lots are said to be held in the spot market which are a matter of negotiation and on which 14½c. per lb. might still be done. But the absorption of resale goods has again placed the market in the hands of producers and general asking prices are 15@16c. per lb. according to seller.

**Tin Oxide**—Weakness in the metal market has brought out lower prices for tin oxide and prominent sellers were offering at 50c. per lb. There was no change in the asking price for tin crystals or bichloride of tin.

**Sulphur**—First-hands report a satisfactory volume of business in refined sulphur and prices are steady. Larger quantities than formerly are moving into agricultural channels. Commercial sulphur, in bags, held at $1.35 per 100 lb., and $1.70 per 100 lb. in cooperage. The roll held at $2 in bags and $2.15 in cooperage. Flowers se.tled at $3 in bags and $3.35 in barrels. The flour in bags is available at $2.25. Crude sulphur is steady at $18@$20 per ton, New York. At the mines $16 is the ruling quotation, bulk basis.

## Alcohol Demand Fair

Offerings of denatured alcohol by outside interests were not so much in evidence and producers here saw no reason to come down in their ideas as to prices. Business was not active, but satisfactory considering the season of the year. Denatured special No. 1, 190 proof, held at 33c. per gal. in drums, and 39c. per gal. in barrels. The No. 1 completely denatured, 188 proof, in drums, was available at 41c. per gal. Formula No. 5, denatured, was unchanged at 32c., in drums. U. S. P. ethyl spirits, 190 proof, was offered by first-hands at $4.70 per gal. Cologne spirit held at $4.75. Methanol was firm but nominally unchanged at $1.18 per gal., in barrels, basis 95 per cent, and $1.20 per gal., in barrels, 97 per cent.

## New Use for Salt and Sodium Arsenate

An increased demand for low-grade salt and for sodium arsenite for use in the campaign against the barberry bush may be expected. This bush spreads the black-stem rust to the wheat fields. Because of that fact, the Department of Agriculture is making a drive on it. Ten pounds of common rock salt applied to the center of the crown of the bush is sufficient to kill the plant. A gallon of the stock solution of sodium arsenite will make 50 gal. of solution, of which 2 gal. poured in the center of the crown of the bush is sufficient for its eradication, the department states.

The department also is recommending increased use of copper sprays and barium water sprays in potato growing. It is pointed out that the expenditures for these sprays ordinarily would constitute only a small part of the profit that would come from the increased yield and from the better composition of the tubers.

# Coal-Tar Products

## Crude Naphthalene Higher Abroad—Phenol Production to Be Augmented—Benzol Quiet—Solvents Scarce

CABLES from England reported a higher market on crude naphthalene, and, according to private advices, production abroad appears to be sold up for the next 2 months. This news led traders here to hold out for full prices quite regardless of the state of trade. Actual buying by the consuming trades was inactive, but, with leading producers in this country behind in deliveries, this situation did not discourage operators. The announcement that the largest consumer of phenol would soon enter the producing field on a scale broad enough to be in a position to offer supplies in the open market took much of the "snap" out of the speculative element and business in outside goods naturally fell away. However, prices did not ease off any.

There were no new developments in the cresylic acid situation. The committee appointed recently for the purpose of handling the application for a reduction of 50 per cent in the prevailing rate of duty held another meeting, but nothing definite was accomplished. Owing to the fact that dyes and coal-tar products are being shipped to this country in a more concentrated form the Treasury Department is considering the proposition of assessing duty in accordance with the increase in the strength.

### Coal-Tar Crudes, Etc.

**Benzene**—Demand has been disappointing but with the motoring season not yet under way, producers are inclined to mark time. The undertone of the market at the close was barely steady. Benzene, 90 per cent, in tanks, was available on contract at 27c. per gal. The pure, water-white, was nominally unchanged at 30@32c. per gal.

**Cresylic Acid**—The past week witnessed the arrival of 131 drums from British ports. Demand was quiet and prices for the imported redistilled were unsettled. On duty-paid material there were sellers at $1.25@$1.35 per gal., a decline of 10c. from the nominal price named a week ago. Domestic production is well sold ahead and first hands refused to name a flat price. Contract deliveries are going out against purchases at close to 78c. per gal.

**Naphthalene**—The feature in the market was the stronger position in crude in the British markets. Cables received late in the week quoted 4c. per lb. on good quality crude for April-May shipment, which compares with 3¾c. per lb. a week ago. Some traders go so far as to say that English producers, with few exceptions, are sold up over the summer positions. Demand in New York from distributors was good, but actual consuming call was not up to expectations. Flake was nominally unchanged at 9¼c., immediate delivery, with balls at 9¾@10c. per lb., round-lot basis.

**Phenol**—While offerings of resale material were light and prices ruled firm, interest in this material fell off somewhat. The announcement that new production would soon come on the market discouraged speculative activity. U.S.P. phenol on spot sold at 55@57c. per lb., but before the close asking prices on resale lots ranged from 57@58c. per lb. Producers took on "regular" contract business at 28c. per lb.

**Aniline Oil**—Prices were repeated by first hands on the 16c. round-lot basis, immediate delivery. Trading was moderate only.

**Salicylic Acid**—Trading in salicylic acid was not so active as a week ago, but, with stocks materially reduced, the market presented a firm undertone in all directions. The technical variety brought 47c. per lb. On the U.S.P. grade 50c. per lb. represented the market.

**Paranitraniline** — Producers reported a firmer market, but did not alter prices. Leading makers quote 75c. per lb.

**Solvent Naphtha**—Demand exceeds the supply and prices named in producing circles were only nominal. The current production is sold up. Nominal prices range from 37@40c. on the water-white, in drums.

# Adopt Standards for Paint

### Reduce Number of Shades and Eliminate Odd-Sized Containers

Reduction in the number of shades and tints of paints, stains and varnishes and elimination of a number of odd sizes of containers were agreed upon Wednesday at a conference of manufacturers, distributors and large consumers with the Division of Simplified Practices of the Department of Commerce. This was the outgrowth of a preliminary conference on this subject held last September.

Plans agreed upon provide that all ½-gal. cans of all types be discontinued and all sizes of containers smaller than ½ pt. except for stains, gold and aluminum paints and household enamels. Two- and three-pound cans are to be eliminated. Pints are to be eliminated in house paints, flat wall paints and porch paints. All sizes less than gallons are to be eliminated for barn and roof paints and shingle stains. Oblong or square varnish cans are to be eliminated in sizes smaller than gallons.

Shades and tints are to be limited as follows: Floor paints, 8; house paints, 32; flat wall paints, 16; enamels, 10; porch paints, 6; roof and barn paints, 4; shingle stains, 12; carriage paints, 8; oil stains, 8; varnish stains, 8; spirit stains, 14; all of the foregoing being exclusive of black and white; oil colors, including black but counting the several shades of a single color as one color, 32; architectural varnish, interior and exterior, 10; marine varnish, 4; miscellaneous, including all not specified in the foregoing, such as japan driers, asphaltum, etc., 28.

# Rubber Latex Forges to Front

The use of rubber latex in tire fabrication is no longer impossible. Recent developments in the art of using this latex promise great improvements in rubber manufacture, according to C. B. Seger, chairman of the board of the United States Rubber Co. Because of the new processes developed it is purposed to begin the import of latex on a large scale at once. In outlining the use of the new material Mr. Seger said:

"Sprayed rubber, the result of a new method of producing crude rubber from original latex, insures a pure and absolutely uniform product for the first time since rubber was discovered.

"Heretofore all rubber produced and sold on the market has been coagulated out of rubber latex, by means either of smoke or chemicals.

"Rubber produced by old primitive native methods of heat and astringent smoke over slow fire is contaminated with smoke and other combustion products. Nor can there be any assurance of uniform quality.

"When rubber is produced by treating latex with acetic acid, rubber contains acid residues. Acid tends to destroy some of the valuable natural properties of latex.

"New spraying process takes latex, sprays it into a snow-white mist and brings this snow-white mist into contact with pure superheated air, driving the water out of the latex—and nothing else.

"Sprayed rubber is 100 per cent pure solids from virgin latex. No acid, no smoke. It is dry and pure and remains so.

"Sprayed rubber has greater strength, because it contains all natural strength of rubber of original latex unimpaired by chemicals or destructive effect of machine working. It is uniform in quality, something never before obtained."

# Finds Nitrate Refining Process

A large saving in labor costs and a much better product is secured by the application to Chilean nitrates of a new process of refining, according to a report which has been received by the Department of Commerce from Santiago.

The process is the invention of M. Davieusart, a French chemical engineer. He recently demonstrated his process before a gathering of engineers at Santiago.

# Vegetable Oils and Fats

## Cottonseed Steadies—Linseed Futures Unsettled—China Wood at New High—Tallow Closes Lower

THE feature was the decline in tallow prices which took place late last week. The lower London market frightened holders and brought out actual business at a decline of ¼c. Cottonseed oil steadied on support in the nearby positions, refiners evidently taking on May contracts because of the strong statistical position of the old crop months. Arrivals of foreign linseed oil were reported, which helped out the spot situation. On futures traders were disposed to hold off for lower prices. China wood sold at 40c. per lb., on spot, a belated short being the buyer. Coconut oil was offered at 9c., sellers' tanks, coast.

**Linseed Oil**—Spot oil was tight in all directions and prices were maintained on the basis of $1.17 per gal., in barrels, carload lots. June oil, domestic, held at $1.14, with July forward at $1.10. Foreign oil, June shipment from the other side, sold at $1.02@$1.03, duty paid, bulk basis. On futures the undertone was easier, the larger consumers holding off because of the good crop prospects in this country and the feeling that Argentine offerings of seed will not diminish for some time to come. The fact that the Argentine has shipped 26,500,000 bushels of seed since the first of the year has convinced many in the trade that a record crop was produced in that country. According to the Department of Agriculture the area in the United States this coming season will be almost doubled. This preliminary estimate on the flaxseed crop is based on a report covering "intended plantings" and will be subjected to many changes. There were offerings of Argentine seed afloat at $2.40 per bu., c.i.f. New York. During the past week India exported 448,000 bushels of seed, indicating that the new crop is moving. Linseed cake for export was nominal at $34.50@$36 per ton, f.a.s. New York, as to seller and position. Importations of seed from the Argentine assumed large proportions last week and mills are gradually catching up on deliveries.

**Cottonseed Oil**—Refiners were buyers of nearby refined in the option market and sold distant futures in an effort to hold prices down. However, the market developed a firmer undertone, reflecting the strong statistical situation and unfavorable news on weather conditions in the cotton belt. The estimate on "intended plantings" of cotton, showing an increase of 12 per cent in the acreage, had little influence upon the market. The report which was issued about a week ago by the Department of Agriculture was very much in line with private estimates. Crude oil sold at 10c. per lb., tank cars, f.o.b. mills, southeast and Texas, with offerings light. Bleachable oil was quiet but steady at 10¼c., f.o.b. mills, Texas common points. Cash trade in refined oil was less active. Lard was unsettled in the west. Hogs held at $7.60@$8.00 per 100-lb., Chicago, with receipts liberal. Lard compound was unsettled at 13¼c. per lb., carload lots, f.o.b. New York. Oleo stearine sold at 10¼c. per lb.

**China Wood Oil**—A parcel of 50 barrels sold on spot at 40c. per lb., a new high for the movement. May-June closed at 30c., with July forward at 26¼@26¾c.

**Coconut Oil**—No large sales went through last week. The market held at 9¼c., sellers' tanks, New York, and 9c., sellers' tanks, f.o.b. Pacific coast ports. The undertone was barely steady. Copra was nominally unchanged. South Seas sun-dried, in bags, held at 5¼c., coast and 5⅞@5¾c. New York, c.i.f. basis.

**Corn Oil**—Sales of crude oil were reported at 10¼c., sellers' tanks, f.o.b. middle western points.

**Olive Oil**—Sulphur oil, prime green, was raised to 10¼@10½c. per lb. in some quarters, in sympathy with the higher primary markets.

**Palm Oils**—Demand slow and market closed easy on the drop in tallow. Lagos for shipment 8¼c. per lb. Niger for summer positions closed at 8@8¼c. nominal.

**Rapeseed Oil**—English refined on spot was offered at 84¼c. On April-May shipment from the other side 85¼c. per gal. was asked.

**Soya Bean Oil**—May shipment from the Pacific coast was offered at 10¼c., duty paid, sellers' tanks. On futures 10⅞c. was asked. Bulk oil in bond, May-June shipment from the Orient, closed at 7.90c. per lb., c.i.f. New York.

**Fish Oils**—The nominal quotation for crude menhaden oil for future delivery was 53c. per gal., tank car basis, f.o.b. works. No new business came to light. The market was barely steady at the close. Newfoundland tanked cod oil was unchanged at 68@70c. per gal.

**Tallow and Greases**—Sales of extra special tallow at 8⅝c. per lb., ex plant, a drop of ⅛c. for the week, completely upset the market. At the regular London weekly auction prices declined 2 shillings per 112-lb. Yellow grease was easy at 8¼@8⅜c. per lb., New York.

## Procter & Gamble Suit Dismissed

The Federal Trade Commission announces the dismissal of its formal complaint against the Procter & Gamble Distributing Co., of Cincinnati, Ohio. The practice complained of was that of guaranteeing against price decline in the sale of soaps.

## Miscellaneous Materials

**Varnish Gums**—There were sellers of Batavian damar on spot at 30@31c. per lb. Cables were firm and import prices were virtually on a parity with the New York market. Trading was described as routine only. In high-grade kauri gums prices were firmly maintained because of the light offerings from the primary centers, production being disappointing.

**Fluorspar**—Steady prices were the rule. Acid grades, 98½ per cent or better, settled at $27.50@$28 per ton, delivered.

**Casein** — Recent importations, together with freer offerings from domestic sources, eased the market. There were sellers of nearby material at 22@23c. per lb. Spot casein was available at 23@24c. per lb.

**Barytes**—The market on prime floated barytes held at $28 per ton, f.o.b. St. Louis. Trading at these prices has been moderate only. The New York market was unchanged at $42 per ton, asked.

**Shellac**—Offerings were freer and T. N. on spot sold down to 70c. per lb. Unsettled primary markets brought out a little pressure. Bleached, bone dry, settled at 84@86c. per lb. Superfine orange on spot closed at 77@78c. per lb.

**Naval Stores**—Prices again went off in the market for spirits and final quotations of $1.42@$1.43 per gal. were little more than nominal. The recent sharp uplift in prices restricted buying, while new season's offerings continue to come forward. Rosins were in steady demand and prices were maintained on the $6.25 basis for the "B" grade.

**Glycerine** — Chemically pure was barely steady at 18c. per lb., in drums. Dynamite was available at 16½c. in the middle west, while operators in New York territory quoted 16¼c. Crude soap-lye, basis 80 per cent, loose, held at 10¼c., with no sales reported. On the saponification 11¾c. was asked at middle-western points, carlots, loose.

**White Lead**—The recent decline in pig lead to the 8c. basis brought out no changes in the market for pigments. Corroders, however, were no longer so bullish in their ideas. Standard dry white lead (basic carbonate) held at 9¾c. per lb., casks, carload basis.

**Zinc Oxide**—Easier prices again prevailed for the metal without affecting the market for zinc oxide. Producers continued to quote American process lead free at 8c. per lb., carload lots. Red seal, French process, was traded in on the 9¾c. carload basis. Demand, taken as a whole, was less active.

## Unreasonable Rate on Muriate

The Interstate Commerce Commission has found the rate on muriate of potash in carloads from Wilmington, Cal., to Bay City, Mich., and to Niagara Falls, N. Y., to be unreasonable. Reparation was awarded to the Diamond Match Co., the complainant.

## The Swiss Dye Industry

In 1922 the exports of aniline dyes from Switzerland totaled 3,872,800 kg., with a value of 55,257,000 francs, thus exhibiting very little change as compared with the previous year. On the other hand, the exportation of artificial indigo made good progress and totaled 3,460,800 kg., with a value of 13,158,000 francs, as against 1,182,900 kg., with a value of 9,497,000 francs in 1921. The chief purchaser was China, with 9,948,000 francs; that country requires large quantities of artificial indigo for her cheap cotton fabrics. Although the quantity of exported indigo has almost trebled, the value has not gone up by more than four-tenths, as competition on the world's markets has been very keen of late. The second best customer for Swiss artificial indigo was Japan, which, however, took a much smaller amount, this country having itself developed a considerable dye-making industry in recent years. The principal buyers of Swiss aniline dyes were: France (13.9 million francs), Great Britain (13.1), United States (12.7), Belgium (2.5), Italy (2.0) and Japan (1.4).

## Will Smoke Protect Orchards?

Orchard protection by smoke clouds may become a commercial possibility. Arrangements to measure the effectiveness of such clouds in preventing nocturnal cooling have been made recently by the Weather Bureau, as a result of requests from fruit growers and others. Further tests will be made at Edgewood Arsenal in co-operation with the Chemical Welfare Service of the army. Prof. H. H. Kimball and Prof. J. W. Smith of the Weather Bureau will be in charge of this work. It is proposed to set up instrument shelters over a large area, and to cover a part of this area with a smoke screen on nights favorable for frost. Temperature readings in both the covered and uncovered areas will be made and compared.

It is believed that several tests of this kind will establish the feasibility of this method of frost protection and make it possible for the Weather Bureau to decide whether it is economical and practical.

## Alcohol Interests to Produce Potash and Fertilizer

Two Baltimore concerns, the United States Chemical Co. and the research department of the United States Industrial Alcohol Co., are planning improvements which are estimated at not less than $1,000,000.

The reclamation plant, which manufactures potash for agricultural purposes, is to be enlarged and its capacity increased.

The plans include the erection of a fertilizer factory, which will utilize directly the potash produced there and will be a complete mixed fertilizer producing unit.

## Imports at New York

April 20 to April 27

**ACIDS**—400 csk. citric, Palermo, Order; 20 cs. stearic, Rotterdam, M. W. Parsons; 140 cs. formic, Rotterdam, R. W. Greeff & Co.; 40 dr. cresylic, Glasgow, Order; 60 kegs hydrosulphite, Liverpool, Kuttroff, Pickardt Co.; 24 dr. cresylic, Liverpool, Jordan Bros.; 67 dr. cresylic, Liverpool, Order; 3 bbl. acetic, Genoa, Bush, Beach & Gent.

**ALCOHOL**—80 bbl. denatured, Arecibo, C. Esteva; 25 bbl. do., Arecibo, M. Feigel Bros.

**ALUM**—75 csk., Hamburg, Order.

**AMMONIUM**—15 pkg. carbonate, Liverpool, Brown Bros. & Co.

**ARGOLS**—27 csk. Liverpool, Royal Baking Powder Co.

**ARSENIC**—130 csk., Liverpool, Order; 100 bbl., Tampico, American Metal Co.; 50 cs., Rio de Janeiro, Order.

**ASPHALTUM**—428 sk., Havana, Lamson Asphalt & Chemical Co.

**BORAX** — 16 bbl., Cienfuegos, Knauth Bros.

**BRONZE POWDER** — 21 cs., Bremen, Gerstendorfer Bros.; 17 cs., Bremen, B. F. Drackenfeld & Co.; 15 cs., Bremen, Fuchs & Lang Mfg. Co.

**CASEIN**—210 sk., Wellington, Asia Banking Corp.; 267 bg., Havre, National City Bank; 667 bg., Buenos Aires, Nat'l City Bank; 1,251 bg., Buenos Aires, Bank of America; 1,231 bg., Buenos Aires, Order.

**CHALK** — 900 pkg., Antwerp, Bankers Trust Co.; 822,998 kilos, Dunkirk, Taintor Trading Co.; 508,073 kilos, Dunkirk, J. W. Higman Co.

**CHEMICALS**—5 csk., Hamburg, Pfaltz & Bauer; 3 cs., Hamburg, Merck & Co.; 105 pkg., Hamburg, Order.

**COPRA**—1,203 bg., Kingston, Franklin Baker Co.; 150 bg., Port Antonio, Order.

**COPPER SULPHATE**—160 csk., Marseilles, Order; 200 csk., Liverpool, Order; 60 csk., Marseilles, Order.

**COLORS** — 29 pkg., Bremen, Hensel, Bruckmann & Lorbacher; 68 csk. earth, Bremen, L. H. Butcher Co.; 16 csk. ultramarine, Liverpool, Fezandie & Sperrle; 2 cs. aniline, Hamburg, H. A. Metz & Co.; 6 csk. do., Hamburg, Franklin Imp. & Exp. Co.; 10 csk. do., Hamburg, E. C. Foster; 5 csk. do., Hamburg, H. R. Jahn; 26 csk. aniline, 2 dr. do., 2 bbl. do., 1 cs. do., Genoa, Wetterwold & Pfeister; 4 pkg. aniline, Genoa, H. R. Ackermann; 1 bbl. aniline, Genoa, Am. Aniline Products Co.; 101 cs. dyes, Genoa, National Aniline Chem. Co.; 12 bbl. aniline, Genoa, Bachmeier & Co.; 17 bbl. aniline colors, Genoa, Order; 18 csk. earth, Havre, Reichard-Coulston, Inc.; 8 csk. colors, Havre, Italian Discount & Trust Co.; 58 csk. earth, Rotterdam, Heller & Merg Co.; 8 pkg. aniline, Rotterdam, Wetterwold & Pfeister; 11 pkg. aniline, Rotterdam, H. A. Metz & Co.; 200 pkg. red, Havre, Heemsoth, Basse Co.; 12 csk. aniline, Havre, Sandoz Chem. Works 5 csk. do., Havre, Order; 7 cs. do., Havre, Irving Bank; 3 csk. aniline, Liverpool, Order; 203 pkg. earth, Leghorn, Reichard-Coulston, Inc.; 88 bbl. earth, Leghorn, Order; 64 csk. ocher, Marseilles, Bankers Trust Co.; 100 csk. ocher, Marseilles, Metropolitan Trust Co.; 488 csk. ocher, Marseilles, Reichard-Coulston, Inc.; 60 csk. ocher, Marseilles, Order.

**DEXTRINE**—250 bg., Rotterdam, Stein, Hall & Co.

**DIVI-DIVI** — 818 bg., Curacao, Selma Merc. Corp.

**FERTILIZER**—20 bg. chemical, London, C. Schwake & Co.

**FERRO-CHROME** — 546 csk., Gothenburg, C. Hardy & Ruperti; 15 csk., Gothenburg, Heydemann & Co.

**GLAUBERS SALT**—168 pkg., Hamburg, Roessler & Hasslacher Chem. Co.

**GLYCERINE**—70 dr., Marseilles, Order; 58 dr., Buenos Aires, Core & Herbert.

**GUMS**—395 bg. yacca, Port Adelaide, W. Schall & Co.; 13 bg. copal, London, S. Winterbourne & Co.; 100 bg. gum, London, Anglo Egypt. Bank; 24 bg. tragacanth, London, Order; 36 bg. copal, London, Order; 100 cs. damar, Batavia, W. Schall & Co.; 500 cs. damar, Batavia, Order; 100 cs. damar, Singapore, Chase Nat'l Bank; 447 cs. elemi, Manila, H. Dobler.

**IRON OXIDE**—72 csk., Liverpool, J. A. McNulty; 10 csk., Liverpool, Toch Bros.; 10 csk. Liverpool, Order.

**LYCOPODIUM**—4 pkg., Danzig, Rapaport Food Products.

**LOGWOOD**—1,743,588 lb., Hayti, Oakes Mfg. Co.

**MAGNESIUM**—250 bg. calcined, Rotterdam, H. J. Baker & Bro.; 140 csk. calcined, Glasgow, Brown Bros. & Co.; 250 bg. carbonate, Glasgow, Order.

**MYROBOLANS** — 7,635 pkt., Calcutta, Order.

**NAPHTHALENE** — 720 bg., Liverpool, Order.

**QUEBRACHO** — 411 bg., Buenos Aires, Columbia Trust Co.

**OILS**—**Cod**—300 csk., St. Johns National Oil Products Co.; 200 csk., St. Johns, R. Badcock & Co. **Fusel**—17 bbl., Riga, Order. **Linseed**—176 bbl., Rotterdam, Elbert & Co.; 177 bbl., Rotterdam, Welch, Holme & Clark Co.; 141 bbl., Rotterdam, F. D. Lockwood; 570 bbl., Rotterdam, Nat'l Lead Co.; 141 bbl., Rotterdam, Meteor Products Co.; 145 bbl., Rotterdam, Bur-Mac Chemical Co.; 100 bbl., Rotterdam, Nat'l City Bank; 1,688 bbl., Rotterdam, Order; 8,219 bg., Buenos Aires, Order; 300 bbl., Copenhagen, Order. **Olive Foots** (sulphur oil)—100 csk., Leghorn, Am. Co. for Int'l Commerce. **Palm**—214 csk., Rotterdam, Order; 189 csk., Liverpool, Niger Co; 34 csk., Liverpool, Fourth St. Nat'l Bank, 99 csk., Liverpool, Order. **Palm kernel**—48 bbl., Liverpool, E. F. Drew & Co. **Rapeseed**—10 bbl., Rotterdam, Order.

**PLUMBAGO**—200 bbl., Colombo, H. P. Winter & Co.; 384 bbl., Colombo, Brown Bros. & Co.; 483 bbl., Colombo, H. W. Peabody & Co.; 20 bbl., Colombo, Nat'l City Bank; 443 pkg., Colombo, First Federal Foreign Banking Association.

**POTASSIUM SALTS**—2,000 bg. sulphate, Bremen, A. Vogel; 256 csk. salts, Hamburg, Superfos Co.; 2,000 bg. muriate, 2,500 bg. sulphate, 4,000 bg. manure salt, Hamburg, Order; 18 bbl. prussiate, Hamburg, Order; 200 dr. permanganate, Hamburg, Order; 40 dr. permanganate, London, R. W. Greeff & Co.; 60 kegs prussiate, Liverpool, Order.

**PHOSPHATE**—300 bg. bone, Antwerp, Hollinghurst & Co.; 500 bg. do., Antwerp, Order.

**SAL AMMONIAC** — 20 bbl., Hamburg, Roessler & Hasslacher Chem. Co.

**SEEDS**—**Linseed**—28,866 bg., Rosario, Spencer Kellogg & Sons; 44,221 bg., Rosario, Order; 19,730 bg., Rosario, Am. Exchange Nat'l Bank; 6,234 bg., Rosaria, Am. Linseed Co.; 24,899 bg., Rosario, Am Linseed Co.; 32,688 bg., Villa Constitucion, Order; 32,552 bg., San Nicolas, Order.

**SHELLAC** — 10 cs., Hamburg, Irving Bank-Col. Trust Co.; 516 pkg., 30 pkg. button, 150 pkg. garnet, Calcutta, Bank of British West Africa; 500 bg., Calcutta, Irving Bank-Col. Trust Co.; 200 bg., Calcutta, N. Y. Trust Co.; 109 bg, Calcutta, Lee, Higginson & Co.; 100 bg., Calcutta, N. Y. Trust Co.; 2,036 pkg., Calcutta, Order.

**SILVER SULPHIDE**—Antofagasta, Am. Smelting & Refining Co.

**SODIUM SALTS**—300 csk. hyposulphite, Hamburg, Order; 22 csk. perborate, Hamburg, E. Suter & Co.; 6,320 sk. sulphate, Antogafasta, Graham, Rowe & Co.; 15,281 bg. nitrate, Iquique, Baring Bros & Co.; 336 cs. salts, Havre, Nat'l City Bank; 23 csk. prussiate, Liverpool, H. J. Baker Bros.

**STARCH**—250 bg. potato, Rotterdam, J. Wertheimer & Sons; 250 bg. do., Rotterdam, G. J. Kluyskeus; 500 bg. Starch, Rotterdam. Spier, Simmons Co

**STRONTIUM NITRATE**—37 csk., Hamburg, Order.

**SUMAC** — 20 csk. extract, Glasgow, American Dyewood Co.

**TALC**—1,000 bg., Genoa, Italian Discount & Trust Co.

**TALLOW** — 180 bbl., Vancouver, Van Iderstine Co.; 23 bbl., Ponce, Swift & Co.; 295 csk., Buenos Aires, Bank of the Manhattan Co.

**TARTAR**—600 bg., Buenos Aires Tartar Chem. Co.; 199 sk., Marseilles, Royal Baking Powder Co.; 110 sk., Marseilles, C. Pfizer & Co.

**WAXES**—21 bg. bees, London, Order; 16 bg. bees, San Antonio, Order; 62 bg. bees, Talcahuano, Order; 40 cs. bees, Havre, Salomon Bros.; 50 bg. bees, Singapore, A. M. Allison & Co.; 25 bg. bees, Havana, W. H. Bowdlear Co.; 25 bg. bees, Havana, Order.

**ZINC WHITE**—25 bbl., Marseilles, Order.

# Current Prices in the New York Market

***For Chemicals, Oils and Allied Products***

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

## General Chemicals

| | | | |
|---|---|---|---|
| Acetic anhydride, 85%, drums | lb. | $0.38 – | .... |
| Acetone, drums | lb. | .25 – | .25½ |
| Acid, acetic, 28%, bbl. | 100 lb. | 3.17½ – | 3.92½ |
| Acetic, 56%, bbl. | 100 lb. | 6.35 – | 6.37 |
| Glacial, 99½%, bbl. | 100 lb. | 12.05 – | 12.85 |
| Boric, bbl. | lb. | .11 – | .11½ |
| Citric, kegs | lb. | .49 – | .50 |
| Formic, 85% | lb. | .14½ – | .17 |
| Gallic, tech. | lb. | .45 – | .50 |
| Hydrofluoric, 52%, carboys | lb. | .12 – | .12½ |
| Lactic, 44%, tech., light, bbl. | lb. | .11½ – | .12 |
| 22% tech., light, bbl. | lb. | .05½ – | .06 |
| Muriatic, 18° tanks | 100 lb. | .90 – | 1.00 |
| Muriatic, 20°, tanks, | 100 lb. | 1.00 – | 1.10 |
| Nitric, 36°, carboys | lb. | .04½ – | .05 |
| Nitric, 42°, carboys | lb. | .06 – | .06½ |
| Oleum, 20%, tanks | ton | 18.50 – | 19.00 |
| Oxalic, crystals, bbl. | lb. | .13½ – | .13¾ |
| Phosphoric, 50% carboys | lb. | .07½ – | .08½ |
| Pyrogallic, resublimed | lb. | 1.50 – | 1.60 |
| Sulphuric, 60°, tanks | ton | 9.50 – | 11.00 |
| Sulphuric, 60°, drums | ton | 13.00 – | 14.00 |
| Sulphuric, 66°, tanks | ton | 16.00 – | 16.50 |
| Sulphuric, 66° drums | ton | 20.00 – | 21.00 |
| Tannic, U.S.P., bbl. | lb. | .65 – | .70 |
| Tannic, tech., bbl. | lb. | .45 – | .50 |
| Tartaric, imp. crys., bbl. | lb. | .36 – | .... |
| Tartaric, imp., powd., bbl. | lb. | .36 – | .... |
| Tartaric, domestic, bbl. | lb. | .36 – | .... |
| Tungstic, per lb. | lb. | 1.10 – | 1.20 |
| Alcohol, butyl, drums, f.o.b. works | lb. | .26 – | .28 |
| Alcohol ethyl (Cologne spirit), bbl. | gal. | 4.75 – | 4.95 |
| Ethyl, 190p'f, U.S.P., bbl. | gal. | 4.70 – | .... |
| Alcohol, methyl (see Methanol) | | | |
| Alcohol, denatured, 190 proof | | | |
| No. 1, special bbl. | gal. | .39 – | .41 |
| No. 1, special, dr. | gal. | .33 – | .35 |
| No. 1, 188 proof, bbl. | gal. | .40 – | .42 |
| No. 1, 188 proof, dr | gal. | .34 – | .36 |
| No. 5, 188 proof, bbl. | gal. | .38 – | .40 |
| No. 5, 188 proof, dr. | gal. | .32 – | .34 |
| Alum, ammonia, lump, bbl. | lb. | .03¼ – | .03½ |
| Potash, lump, bbl. | lb. | .03 – | .03¼ |
| Chrome, lump, potash, bbl. | lb. | .05½ – | .05½ |
| Aluminum sulphate, com., bags | 100 lb. | 1.50 – | 1.65 |
| Iron free bags | lb. | .02½ – | .02¾ |
| Aqua ammonia, 26°, drums | lb. | .06½ – | .07½ |
| Ammonia, anhydrous, cyl. | lb. | .30 – | .30½ |
| Ammonium carbonate, powd. casks, imported | lb. | .09½ – | .10 |
| Ammonium carbonate, powd. domestic, bbl. | lb. | .13 – | .14 |
| Ammonium nitrate, tech., casks | lb. | .10 – | .11 |
| Amyl acetate tech., drums | gal. | 3.50 – | 3.75 |
| Arsenic, white, powd., bbl. | lb. | .15½ – | .16 |
| Arsenic, red, powd., kegs | lb. | .14½ – | .15 |
| Barium carbonate, bbl. | ton | 78.00 – | 80.00 |
| Barium chloride, bbl. | ton | 90 00 – | 95.00 |
| Barium dioxide, drums | lb. | .18 – | .18½ |
| Barium nitrate, casks | .... | .08 – | .08½ |
| Barium sulphate, bbl. | lb. | .04 – | .04½ |
| Blanc fixe, dry, bbl. | lb. | .04½ – | .04¾ |
| Bleaching powder, f.o.b. wks., drums | 100 lb. | 2.15 – | .... |
| Spot N. Y. drums | 100 lb. | 2.60 – | 2.70 |
| Borax, bbl. | lb. | .05½ – | .05½ |
| Bromine, cases | lb. | .28 – | .30 |
| Calcium acetate, bags | 100 lb. | 4.00 – | 4.05 |
| Calcium carbide, drums | lb. | .04¼ – | .04½ |
| Calcium chloride, fused, drums | ton | 22.00 – | 23.00 |
| Gran. drums | lb. | .01½ – | .01¾ |
| Calcium phosphate, mono, bbl. | lb. | .06½ – | .07 |
| Camphor, cases | lb. | .88 – | .90 |
| Carbon bisulphide, drums | lb. | .07 – | .07¼ |
| Carbon tetrachloride, drums | lb. | .10 – | .... |
| Chalk, precip.—domestic, light, bbl. | lb. | .04½ – | .04¾ |
| Domestic, heavy, bbl. | lb. | .03¾ – | .03¾ |
| Imported, light, bbl. | lb. | .04¼ – | .05 |
| Chlorine, liquid, cylinders | lb. | .06 – | .06½ |
| Chloroform, tech., drums | lb. | .35 – | .38 |
| Cobalt oxide, bbl. | lb. | 2.10 – | 2.25 |
| Copperas, bulk, f.o.b. wks. | ton | 16.50 – | 20.00 |
| Copper carbonate, bbl. | lb. | .19 – | .20 |
| Copper cyanide, drums | lb. | .47 – | .50 |
| Copper sulphate, crys., bbl., 100 lb. | | 6.00 – | 6.25 |
| Cream of tartar, bbl. | lb. | .25½ – | .26½ |
| Epsom salt, dom., tech., bbl. | 100 lb. | 1.90 – | 2.15 |
| Epsom salt, imp., tech., bags | 100 lb. | 1.10 – | 1.25 |
| Epsom salt, U.S.P., dom., bbl. | 100 lb. | 2.50 – | 2.60 |
| Ether, U.S.P., drums | lb. | .13 – | .15 |
| Ethyl acetate, com., 85%, drums | gal. | .80 – | .85 |
| Ethyl acetate, pure (acetic ether, 98% to 100%) | gal. | .95 – | 1.00 |
| Formaldehyde, 40%, bbl. | lb. | .14½ – | .16 |
| Fullers earth—imp., powd., net | ton | $30.00 – | $32.00 |
| Fusel oil, ref., drums | gal. | 3.55 – | 4.05 |
| Fusel oil, crude, drums | gal. | 2.30 – | 2.40 |
| Glaubers salt, wks., bags | 100 lb. | 1.20 – | 1.40 |
| Glaubers salt, imp., bags | 100 lb. | 1.00 – | 1.25 |
| Glycerine, c.p., drums extra | lb. | .18 – | .18½ |
| Glycerine, dynamite, drums | lb. | .16½ – | .16½ |
| Iodine, resublimed | lb. | 4.55 – | 4.65 |
| Iron oxide, red, casks | lb. | .12 – | .18 |
| Lead: | | | |
| White, basic carbonate, dry, casks | lb. | .09½ – | .10 |
| White, basic sulphate, casks | lb. | .09½ – | .... |
| White, in oil, kegs | lb. | .12½ – | .14 |
| Red, dry, casks | lb. | .11½ – | .12 |
| Red, in oil, kegs | lb. | .13½ – | .15 |
| Lead acetate, white crys., bbl. | lb. | .13½ – | .14 |
| Brown, broken, casks | lb. | .12 – | .... |
| Lead arsenate, powd., bbl. | lb. | .23 – | .24 |
| Lime-Hydrated, bbl. | per ton | 16.80 – | 17.00 |
| Lime, Lump, bbl. | 280 lb. | 3.63 – | 3.65 |
| Litharge, comm., casks | lb. | .10½ – | .11 |
| Lithophone, bags | lb. | .07 – | .07½ |
| in bbl. | lb. | .07½ – | .07½ |
| Magnesium carb., tech., bags | lb. | .08 – | .08½ |
| Methanol, 95%, bbl. | gal. | 1.21 – | 1.23 |
| Methanol, 97%, bbl. | gal. | 1.23 – | 1.25 |
| Nickel salt, double, bbl. | lb. | .10½ – | .... |
| Nickel salts, single, bbl. | lb. | .11½ – | .... |
| Phosgene | .... | .69 – | .75 |
| Phosphorus, red, cases | lb. | .35 – | .40 |
| Phosphorus, yellow, cases | lb. | .30 – | .35 |
| Potassium bichromate, casks | lb. | .10½ – | .11 |
| Potassium bromide, gran., bbl. | lb. | .16½ – | .23 |
| Potassium carbonate, 80-85%, calcined, casks | lb. | .06½ – | .07 |
| Potassium chlorate, powd. | lb. | .07½ – | .08 |
| Potassium cyanide, drums | lb. | .45 – | .50 |
| Potassium, first sorts, cask | lb. | .09 | .09½ |
| Potassium hydroxide (caustic potash) drums | 100 lb. | 8.25 – | 8.50 |
| Potassium iodide, cases | lb. | 3.65 – | 3.75 |
| Potassium nitrate, bbl. | lb. | .06½ – | .07½ |
| Potassium permanganate, drums | lb. | .23 – | .24 |
| Potassium prussiate, red, casks | lb. | .77 – | .79 |
| Potassium prussiate, yellow, casks | lb. | .37 – | .37½ |
| Salammoniac, white, gran., casks, imported | lb. | .07 – | .07½ |
| Salammoniac, white, gran., bbl., domestic | lb. | .07½ – | .08 |
| Gray, gran., casks | lb. | .08 – | .09 |
| Salsoda, bbl. | 100 lb. | 1.20 | 1.40 |
| Salt cake (bulk) | ton | 26.00 – | 28.00 |
| Soda ash, light, 58% flat, bags, contract | 100 lb. | 1.60 – | 1.67 |
| Soda ash, light, bags, 48%, bags, contract, f.o.b. wks. | 100 lb. | 1.20 – | 1.30 |
| Soda ash, light, 58%, flat, bags, resale | 100 lb. | 1.75 – | 1.80 |
| Soda ash, dense, bags, contract, basis 48% | 100 lb. | 1.17½ – | 1.20 |
| Soda ash, dense, in bags, resale | 100 lb. | 1.85 – | 1.90 |
| Soda, caustic, 76%, solid, drums, f.a.s. | 100 lb. | 3.35 – | 3.45 |
| Soda, caustic, basis 60%, wks., contract | 100 lb. | 2.50 – | 2.60 |
| Soda, caustic, ground and flake, contracts | 100 lb. | 3.80 – | 3.90 |
| Soda, caustic, ground and flake, resale | 100 lb. | 3.72½ – | .... |
| Sodium acetate, works, bags | lb. | .05½ – | .06¼ |
| Sodium bicarbonate, bbl. | 100 lb. | 2.00 – | 2.50 |
| Sodium bichromate, casks | lb. | .07½ – | .08 |
| Sodium bisulphate (niter cake) | ton | 6.00 – | 7.00 |
| Sodium bisulphite, powd., U.S.P., bbl. | lb. | .04½ – | .04½ |
| Sodium chlorate, kegs | lb. | .06½ – | .07 |
| Sodium chloride | long ton | 12.00 – | 13.00 |
| Sodium cyanide, cases | lb. | .20 – | .23 |
| Sodium fluoride, bbl. | lb. | $0.09½ – | $0 10 |
| Sodium hyposulphite, bbl. | lb. | .02½ – | .03 |
| Sodium nitrite, casks | lb. | .08½ – | .09 |
| Sodium peroxide, powd., cases | lb. | .28 – | .30 |
| Sodium phosphate, dibasic, bbl. | lb. | .03½ – | .04 |
| Sodium prussiate, yel. drums | lb. | .17½ – | .18 |
| Sodium silicate (40°, drums) | 100 lb. | .80 – | 1.25 |
| Sodium silicate (60°, drums) | 100 lb. | 2.00 – | 2.25 |
| Sodium sulphide, fused, 60-62% drums | lb. | .04½ – | .04½ |
| Sodium sulphite, crys., bbl. | lb. | .03½ – | .03½ |
| Strontium nitrate, powd., bbl. | lb. | .09½ – | .10 |
| Sulphur chloride, yel drums | lb. | .04½ – | .05 |
| Sulphur, crude | ton | 18.00 – | 20.00 |
| At mine, bulk | ton | 16.00 – | 18.00 |
| Sulphur, flour, bag | 100 lb. | 2.25 – | 2.35 |
| Sulphur, roll, bag | 100 lb. | 2.00 – | 2.10 |
| Sulphur dioxide, liquid, cyl. | lb. | .08 – | .08½ |
| Talc—imported, bags | ton | 30.00 – | 40.00 |
| Talc—domestic powd., bags | ton | 18.00 – | 25.00 |
| Tin bichloride, bbl. | lb. | .13½ – | .14 |
| Tin oxide, bbl. | lb. | .50 – | .52 |
| Zinc carbonate, bags | lb. | .14 – | .14½ |
| Zinc chloride, gran, bbl. | lb. | .06 – | .07 |
| Zinc cyanide, drums | lb. | .37 – | .38 |
| Zinc oxide, , lead free, bbl. | lb. | .08 – | .08½ |
| 5% lead sulphate, bags | lb. | .07½ – | .... |
| 10 to 35% lead sulphate, bags | lb. | .07 – | .... |
| French, red seal, bags | lb. | .09½ – | .... |
| French, green seal, bags | lb. | .10½ – | .... |
| French, white seal, bbl. | lb. | .12 – | .... |
| Zinc sulphate, bbl. | 100 lb. | 2.50 – | 3.00 |

## Coal-Tar Products

| | | | |
|---|---|---|---|
| Alpha-naphthol, crude, bbl. | lb. | $0.70 – | $0.80 |
| Alpha-naphthol, ref., bbl. | lb. | .85 – | .95 |
| Alpha-naphthylamine, bbl. | lb. | .36 – | .38 |
| Aniline oil, drums | lb. | .16 – | .16½ |
| Aniline salts, bbl. | lb. | .24 – | .25 |
| Anthracene, 80%, drums | lb. | .75 – | 1.00 |
| Anthracene, 80%, imp., drums, duty paid | lb. | .70 – | .75 |
| Anthraquinone, 25%, paste, drums | lb. | .70 – | .75 |
| Benzaldehyde U.S.P., carboys | lb. | 1.40 – | 1.45 |
| Benzene, pure, water-white, tanks and drums | gal. | .32 – | .35 |
| Benzene, 90%, tanks & drums | gal. | .27 – | .30 |
| Benzene, 90%, drums, resale | gal. | .30 – | .33 |
| Benzidine base, bbl. | lb. | .85 – | .90 |
| Benzidine sulphate, bbl. | lb. | .70 – | .75 |
| Benzoic acid, U.S.P., kegs | lb. | .72 – | .75 |
| Benzoate of soda, U.S.P., bbl. | lb. | .57 – | .65 |
| Benzyl chloride, 95-97%, ref., drums | lb. | .45 – | .... |
| Benzyl chloride, tech., drums | lb. | .35 – | .... |
| Beta-naphthol, subl., bbl. | lb. | .55 – | .60 |
| Beta-naphthol, tech., bbl. | lb. | .23 – | .23½ |
| Beta-naphthylamine, tech. | lb. | .80 – | .90 |
| Carbazol, bbl. | lb. | .75 – | .90 |
| Cresol, U.S.P., drums | lb. | .25 – | .29 |
| Ortho-cresol, drums | lb. | .28 – | .30 |
| Cresylic acid, 97%, resale, drums | gal. | 1.30 – | .... |
| 95-97%, drums, resale | gal. | 1.25 – | .... |
| Dichlorbenzene, drums | lb. | .07 – | .09 |
| Diethylaniline, drums | lb. | .50 – | .60 |
| Dimethylaniline, drums | lb. | .42 – | .43 |
| Dinitrobenzene, bbl. | lb. | .19 – | .20 |
| Dinitroclorbenzene, bbl. | lb. | .22 – | .23 |
| Dinitronaphthalene, bbl. | lb. | .30 – | .32 |
| Dinitrophenol, bbl. | lb. | .35 – | .40 |
| Dinitrotoluene, bbl. | lb. | .20 – | .22 |
| Dip oil, 25%, drums | gal. | .25 – | .30 |
| Diphenylamine, bbl. | lb. | .50 – | .52 |
| H-acid, bbl. | lb. | .85 – | .... |
| Meta-phenylenediamine, bbl. | lb. | 1.00 – | 1.05 |
| Michlers ketone, bbl. | lb. | 3.00 – | 3.50 |
| Monochlorbenzene, drums | lb. | .08 – | .10 |
| Monoethylaniline, drums | lb. | .95 – | 1.10 |
| Naphthalene, crushed, bbl. | lb. | .08 – | .09 |
| Naphthalene, flake, bbl. | lb. | .09½ – | .10 |
| Naphthalene, balls, bbl. | lb. | .10 – | .10½ |
| Naphthionate of soda, bbl. | lb. | .58 – | .65 |
| Naphthionic acid, crude, bbl. | lb. | .55 – | .60 |
| Nitrobenzene, drums | lb. | .10 – | .12 |
| Nitro-naphthalene, bbl. | lb. | .30 – | .35 |
| Nitro-toluene, drums | lb. | .15 – | .17 |
| N-W acid, bbl. | lb. | 1.25 – | 1.30 |
| Ortho-amidophenol, kegs | lb. | 2.30 – | 2.35 |
| Ortho-dichlorbenzene, drums | lb. | .17 – | .20 |
| Ortho-nitrophenol, bbl. | lb. | .90 – | .92 |
| Ortho-nitrotoluene, drums | lb. | .10 – | .12 |
| Ortho-toluidine, bbl. | lb. | .14 – | .15 |
| Para-amidophenol, base, kegs | lb. | 1.20 – | 1.30 |
| Para-amidophenol, HCl, kegs | lb. | 1.25 – | 1.35 |
| Para-dichlorbenzene, bbl. | lb. | .17 – | .20 |
| Paranitraniline, bbl. | lb. | .74 – | .75 |
| Para-nitrotoluene, bbl. | lb. | .60 – | .65 |
| Para-phenylenediamine, bbl. | lb. | 1.45 – | 1.50 |
| Para-toluidine, bbl | lb. | .95 – | .98 |
| Phthalic anhydride, bbl. | lb. | .35 – | .38 |
| Phenol, U.S.P., drums | lb. | .57 – | .58 |
| Picric acid, bbl. | lb. | .20 – | .22 |
| Pyridine, dom., drums | gal. | nominal | |
| Pyridine, imp., drums | gal. | 2.50 – | 2.75 |

| | | | |
|---|---|---|---|
| Resorcinol, tech., kegs | lb. | $1.40 – | $1.50 |
| Resorcinol, pure, kegs | lb. | 2.00 – | 2.10 |
| R-salt, bbl | lb. | .55 – | .60 |
| Salicylic acid, tech., bbl | lb. | .47 – | .48 |
| Salicylic acid, U.S.P., bbl | lb. | .50 – | .52 |
| Solvent naphtha, water-white, drums | gal. | .37 – | .40 |
| Crude, drums | gal. | .22 – | .24 |
| Sulphanilic acid, crude, bbl | lb. | .18 – | .20 |
| Thiocarbanilide, kegs | lb. | .35 – | .38 |
| Toluidine, kegs | lb. | 1.20 – | 1.30 |
| Toluidine, mixed, kegs | lb. | .30 – | .35 |
| Toluene, tank cars | gal. | .30 – | .35 |
| Toluene, drums | gal. | .35 – | .40 |
| Xylidines drums | lb. | .45 – | .47 |
| Xylene, pure, drums | gal. | .75 – | .85 |
| Xylene, com., drums | gal. | .37 – | ..... |
| Xylene, com., tanks | gal. | .32 – | ..... |

## Naval Stores

| | | | |
|---|---|---|---|
| Rosin B-D, bbl. 280 lb. | | $6.25 – | 6.35 |
| Rosin E-I, bbl. 280 lb. | | 6.35 – | 5.46 |
| Rosin K-N, bbl. 280 lb. | | 6.40 – | 6.50 |
| Rosin W.G.-W.W., bbl. 280 lb. | | 6.80 – | 7.80 |
| Wood rosin, bbl. 280 lb. | | 6.20 – | ..... |
| Turpentine, spirits of, bbl | gal. | 1.42 – | ..... |
| Wood, steam dist., bbl | gal. | 1.36 – | ..... |
| Wood, dest. dist., bbl | gal. | 1.10 – | 1.15 |
| Pine tar pitch, bbl. 200 lb. | | ..... – | 6.00 |
| Tar, kiln burned, bbl. 500 lb. | | ..... – | 12.00 |
| Retort tar, bbl. 500 lb. | | ..... – | 11.00 |
| Rosin oil, first run, bbl | gal. | .45 – | ..... |
| Rosin oil, second run, bbl | gal. | .48 – | ..... |
| Rosin oil, third run, bbl | gal. | .52 – | ..... |
| Pine oil, steam dist | gal. | .80 – | ..... |
| Pine oil, pure, dest. dist | gal. | .75 – | ..... |
| Pine tar oil, ref | gal. | .48 – | ..... |
| Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla | gal. | .32 – | .32½ |
| Pine tar oil, double ref., bbl | gal. | ..... – | .75 |
| Pine tar, ref., thin, bbl | gal. | ..... – | .25 |
| Pinewood creosote, ref., bbl. | gal. | ..... – | .52 |

## Animal Oils and Fats

| | | | |
|---|---|---|---|
| Degras, bbl | lb. | $0.03½ – | $0.04½ |
| Grease, yellow, bbl | lb. | .08½ – | .08¾ |
| Lard oil, Extra No. 1, bbl | gal. | .92 – | .94 |
| Neatsfootoil, 20 deg. bbl | gal. | 1.28 – | 1.32 |
| No. 1, bbl | gal. | .92 – | .94 |
| Oleo Stearine | | .10½ – | ..... |
| Red oil, distilled, d.p. bbl | lb. | .11½ – | ..... |
| Saponified, bbl | lb. | .11½ – | ..... |
| Tallow, extra, loose | lb. | .08½ – | ..... |
| Tallow oil, acidless, bbl | gal. | .95 – | .97 |

## Vegetable Oils

| | | | |
|---|---|---|---|
| Castor oil, No. 3, bbl | lb. | $0.14 – | ..... |
| Castor oil, No. 1, bbl | lb. | .14½ – | ..... |
| Chinawood oil, bbl | lb. | .40 – | ..... |
| Coconut oil, Ceylon, bbl | lb. | .10¼ – | .10½ |
| Ceylon, tanks, N.Y | lb. | .09 – | ..... |
| Coconut oil, Cochin, bbl | lb. | .10½ – | ..... |
| Corn oil, crude, bbl | lb. | .12 – | ..... |
| Crude, tanks, (f.o.b. mill) | lb. | .10½ – | .10¾ |
| Cottonseed oil, crude (f.o.b. mill), tanks | lb. | .10 – | .10½ |
| Summer yellow, bbl | lb. | .12½ – | .12¾ |
| Winter yellow, bbl | lb. | .13¼ – | .13½ |
| Linseed oil, raw, car lots, bbl | gal. | 1.17 – | ..... |
| Raw, tank cars (dom.) | gal. | 1.12 – | ..... |
| Boiled, cars, bbl. (dom.) | gal. | 1.19 – | ..... |
| Olive oil, denatured, bbl | gal. | 1.15 – | ..... |
| Sulphur, (foots) bbl | lb. | .10 – | .10½ |
| Palm, Lagos, casks | lb. | .08½ – | ..... |
| Niger, casks | lb. | .08½ – | .08¾ |
| Palm kernel, bbl | lb. | .09½ – | .10 |
| Peanut oil, crude, tanks (mill) | lb. | .13½ – | ..... |
| Peanut oil, refined, bbl | lb. | .17 – | ..... |
| Per lla, bbl | lb. | .16½ – | .16¾ |
| Rapeseed oil, refined, bbl | gal. | .84 – | .85 |
| Rapeseed oil, blown, bbl | gal. | .90 – | .91 |
| Sesame, bbl | lb. | .13 – | .13½ |
| Soya bean (Manchurian), bbl | lb. | .13½ – | ..... |
| Tank, f.o.b. Pacific coast | lb. | .10¼ – | ..... |
| Tank, (f.o.b. N.Y.) | lb. | .11 – | ..... |

## Fish Oils

| | | | |
|---|---|---|---|
| Cod, Newfoundland, bbl | gal. | $0.68 – | $0.70 |
| Menhaden, light pressed, bbl | gal. | .76 – | ..... |
| White bleached, bbl | gal. | .78 – | ..... |
| Blown, bbl | gal. | .82 – | ..... |
| Crude, tanks (f.o.b. factory) | gal. | .53 – | ..... |
| Whale No. 1 crude, tanks, coast | lb. | .06½ – | ..... |
| Winter, natural, bbl | gal. | .76 – | .78 |
| Winter, bleached, bbl | gal. | .79 – | .80 |

## Oil Cake and Meal

| | | | |
|---|---|---|---|
| Coconut cake, bags | ton | $32.00 – | ..... |
| Copra, sun dried, bags, (c.i.f.) | lb. | .05½ – | ..... |
| Sun dried Pacific coast | lb. | .05¼ – | ..... |
| Cottonseed meal, f.o.b. mills | ton | 39.00 – | 40.00 |
| Linseed cake, bags | ton | 36.00 – | ..... |
| Linseed meal, bags | ton | 38.00 – | ..... |

## Dye & Tanning Materials

| | | | |
|---|---|---|---|
| Albumen, blood, bbl | lb. | $0.45 – | $0.50 |
| Albumen, egg, tech, kegs | lb. | .80 – | .85 |
| Cochneal, bags | lb. | .35 – | .36 |
| Cutch, Borneo, bales | lb. | .04½ – | .05 |
| Cutch, Rangoon, bales | lb. | .13 – | .13½ |
| Dextrine, corn, bags 100 lb. | | 3.64 – | 3.69 |
| Dextrine, gum, bags 100 lb. | | 3.99 – | 4.09 |
| Divi-divi, bags | ton | 38.00 – | 39.00 |
| Fustic, sticks | ton | 30.00 – | 35.00 |
| Fustic, chips, bags | lb. | .04 – | .05 |
| Logwood, sticks | ton | 28.00 – | 30.00 |
| Logwood, chips, bags | lb. | .02½ – | .03¼ |
| Sumac, leaves, Sicily, bags | ton | $70.00 – | $72.00 |
| Sumac, ground, bags | ton | 65.00 – | 67.00 |
| Sumac, domestic, bags | ton | 40.00 – | 42.00 |
| Starch, corn, bags 100 lb. | | 2.97 – | 3.07 |
| Tapioca flour, bags | lb. | .05½ – | .06¼ |

## Extracts

| | | | |
|---|---|---|---|
| Archil, cone., bbl | lb. | $0.17 – | $0.18 |
| Chestnut, 25% tannin, tanks | lb. | .02 – | .03 |
| Divi-divi, 25% tannin, bbl | lb. | .04 – | .05 |
| Fustic, crystals, bbl | lb. | .20 – | .22 |
| Fustic, liquid, 42°, bbl | lb. | .08 – | .09 |
| Gambier, liq., 25% tannin, bbl | lb. | .08 – | .09 |
| Hematine crys., bbl | lb. | .14 – | .18 |
| Hemlock, 25% tannin, bbl | lb. | .04 – | .05 |
| Hypernic, solid, drums | lb. | .24 – | .26 |
| Hypernic, liquid, 51°, bbl | lb. | .14 – | .17 |
| Logwood, crys., bbl | lb. | .19 – | .20 |
| Logwood, liq., 51°, bbl | lb. | .09 – | .10 |
| Quebracho, solid, 65% tannin, bbl | lb. | .04½ – | .05 |
| Sumac, dom., 51°, bbl | lb. | .06½ – | .07 |

## Dry Colors

| | | | |
|---|---|---|---|
| Blacks–Carbongas, bags, f.o.b. works | lb. | $0.16 – | $0.18 |
| Lampblack, bbl | lb. | .12 – | .40 |
| Mineral, bulk | ton | 35.00 – | 45.00 |
| Blues–Bronze, bbl | lb. | .55 – | .60 |
| Prussian, bbl | lb. | .55 – | .60 |
| Ultramarine, bbl | lb. | .08 – | .35 |
| Browns, Sienna, Ital., bbl | lb. | .06 – | .14 |
| Sienna, Domestic, bbl | lb. | .03½ – | .04 |
| Umber, Turkey, bbl | lb. | .04 – | .04½ |
| Greens–Chrome, C.P.Light, bbl | lb. | .32 – | .34 |
| Chrome, commercial, bbl | lb. | .12 – | .12½ |
| Paris, bulk | lb. | .30 – | .35 |
| Reds, Carmine No. 40, tins | lb. | 4.50 – | 4.70 |
| Oxide red, casks | lb. | .10 – | .14 |
| Para toner, kegs | lb. | 1.00 – | 1.10 |
| Vermilion, English, bbl | lb. | 1.30 – | 1.32 |
| Yellow, Chrome, C.P. bbls | lb. | .20 – | .21 |
| Ocher, French, casks | lb. | .02½ – | .03 |

## Waxes

| | | | |
|---|---|---|---|
| Bayberry, bbl | lb. | $0.28 – | $0.30 |
| Beeswax, crude, bags | lb. | .21 – | .25 |
| Beeswax, refined, light, bags | lb. | .32 – | .34 |
| Beeswax, pure white, cases | lb. | .40 – | .41 |
| Candelilla, bags | lb. | .24 – | .25 |
| Carnauba, No. 1, bags | lb. | .42 – | .43 |
| No. 2, North Country, bags | lb. | .23 – | .23½ |
| No. 3, North Country, bags | lb. | .19½ – | ..... |
| Japan, cases | lb. | .14½ – | .15 |
| Montan, crude, bags | lb. | .04½ – | .04½ |
| Paraffine, crude, match, 105-110 m.p. | lb. | .04½ – | .04¾ |
| Crude, scale 124-126 m.p., bags | lb. | .03½ – | .03¾ |
| Ref., 118-120 m.p., bags | lb. | .03½ – | ..... |
| Ref., 125 m.p., bags | lb. | .03½ – | ..... |
| Ref, 128-130 m.p., bags | lb. | .04½ – | .04¾ |
| Ref., 133-135 m.p., bags | lb. | .04½ – | ..... |
| Ref., 135-137 m.p., bags | lb. | .05½ – | .05¾ |
| Stearic acid, agle pressed, bags | lb. | .13½ – | ..... |
| Double pressed, bags | lb. | .14½ – | ..... |
| Triple pressed, bags | lb. | .15½ – | .16 |

## Fertilizers

| | | | |
|---|---|---|---|
| Ammonium sulphate, bulk, f.o.b. works 100 lb. | | $3.25 – | $3.30 |
| F.a.s. double bags 100 lb. | | 3.85 – | 3.90 |
| Blood, dried, bulk | unit | 4.25 – | ..... |
| Bone, raw, 3 and 50, ground | ton | 27.00 – | 30.00 |
| Fish scrap, dom., dried, wks. | unit | nominal | |
| Nitrate of soda, bags 100 lb. | | 2.60 – | 2.65 |
| Tankage, high grade, f.o.b. Chicago unit | | 3.25 – | 3.50 |
| Phosphate rock, f.o.b. mines, Florida pebble, 68-72% | ton | $4.00 – | $4.50 |
| Tennessee, 78-80% | ton | 8.00 – | 8.25 |
| Potassium muriate, 80%, bags | ton | 35.00 – | 36.00 |
| Potassium sulphate, bags basis 90% | ton | 45.67 – | ..... |

## Crude Rubber

| | | | |
|---|---|---|---|
| Para—Upriver fine | lb. | $0.28 – | ..... |
| Upriver coarse | lb. | .26 – | ..... |
| Upriver caucho ball | lb. | .26½ – | ..... |
| Plantation—First latex crepe | lb. | .32 – | ..... |
| Ribbed smoked sheets | lb. | .32 – | ..... |
| Brown crepe, thin, clean | lb. | .30 – | ..... |
| Amber crepe No. 1 | lb. | .31½ – | .32 |

## Gums

| | | | |
|---|---|---|---|
| Copal, Congo, amber, bags | lb. | $0.18½ – | $0.19 |
| East Indian, bold, bags | lb. | .22 – | .23 |
| Manila, pale, bags | lb. | .21 – | .22 |
| Pontinak, No. 1 bags | lb. | .21 – | .22 |
| Damar, Batavia, cases | lb. | .30½ – | .31 |
| Singapore, No. 1, cases | lb. | .34½ – | .35 |
| Kauri, No. 1, cases | lb. | .62 – | .66 |
| Ordinary chips, cases | lb. | .18 – | .20 |
| Manjak, Barbados, bags | lb. | .09 – | .09½ |

## Shellac

| | | | |
|---|---|---|---|
| Shellac, orange fine, bags | lb. | $0.74 – | ..... |
| Orange superfine, bags | lb. | .76 – | ..... |
| A. C. garnet, bags | lb. | nominal | |
| Bleached, bonedry | lb. | .84 – | ..... |
| Bleached, fresh | lb. | .72 – | ..... |
| T. N., bags | lb. | .70 – | .71 |

## Miscellaneous Materials

| | | | |
|---|---|---|---|
| Asbestos, crude No. 1, f.o.b., Quebec sh. ton | | $500.00 – | ..... |
| Asbestos, shingle, f.o.b., Quebec sh. ton | | $65.00 – | $85.00 |
| Asbestos, cement, f.o.b., Quebec sh. ton | | 20.00 – | 25.00 |
| Barytes, grd., white, f.o.b. mills, bbl net ton | | 16.00 – | 20.00 |
| Barytes, grd., off-color, f.o.b. mills bulk net ton | | 13.00 – | 15.00 |
| Barytes, floated, f.o.b. St. Louis, bbl net ton | | 28.00 – | ..... |
| Barytes, crude f.o.b. mines, bulk net ton | | 10.00 – | 11.00 |
| Casein, bbl., tech lb. | | .23 – | .25 |
| China clay (kaolin) crude, f.o.b. Ga net ton | | 7.00 – | 9.00 |
| Washed, f.o.b. Ga net ton | | 8.00 – | 9.00 |
| Powd., f.o.b. Ga net ton | | 13.00 – | 20.00 |
| Crude f.o.b. Va net ton | | 8.00 – | 12.00 |
| Ground, f.o.b. Va net ton | | 13.00 – | 20.00 |
| Imp., lump, bulk net ton | | 15.00 – | 20.00 |
| Imp., powd net ton | | 45.00 – | 50.00 |
| Feldspar, No. 1 pottery long ton | | 6.00 – | 7.00 |
| No. 2 pottery long ton | | 5.00 – | 5.50 |
| No. 1 soap long ton | | 7.00 – | 7.50 |
| No. 1 Canadian, f.o.b. mill long ton | | 25.00 – | 27.00 |
| Graphite, Ceylon, lump, first quality, bbl lb. | | .06 – | .06½ |
| Ceylon, chip, bbl lb. | | .05 – | .05½ |
| High grade amorphous crude ton | | 35.00 – | 50.00 |
| Gum arabic, amber, sorts, bags lb. | | .15 – | .16 |
| Gum tragacanth, sorts, bags lb. | | .50 – | .60 |
| No. 1, bags lb. | | 1.60 – | 1.65 |
| Kieselguhr, f.o.b. Cal ton | | 40.00 – | 42.00 |
| F.o.b. N. Y ton | | 50.00 – | 55.00 |
| Magnesite, crude, f.o.b. Cal ton | | 14.00 – | 15.00 |
| Pumice stone, imp., casks lb. | | .03 – | .05½ |
| Dom., lump, bbl lb. | | .05 – | .05½ |
| Dom., ground, bbl lb. | | .06 – | .07 |
| Silica, glass sand, f.o.b. Ind ton | | 2.00 – | 2.50 |
| Silica, sand blast, f.o.b. Ind ton | | 2.50 | 5.00 |
| Silica, amorphous, 250-mesh, f.o.b. Ill ton | | 17.00 – | 17.50 |
| Silica, bldg. sand, f.o.b. Pa ton | | 2.00 – | 2.75 |
| Soapstone, coarse, f.o.b. Vt., bags ton | | 7.00 – | 8.00 |
| Tale, 200 mesh, f.o.b., Vt., bags ton | | 6.50 – | 9.00 |
| Tale, 200 mesh, f.o.b. Ga., bags ton | | 7.00 – | 9.00 |
| Tale, 200 mesh, f.o.b. Los Angeles, bags ton | | 16.00 – | 20.00 |

## Mineral Oils

Crude, at Wells

| | | | |
|---|---|---|---|
| Pennsylvania | bbl. | $3.75 – | ..... |
| Corning | bbl. | 2.15 – | ..... |
| Cabell | bbl. | 2.41 – | ..... |
| Somerset | bbl. | 2.20 – | ..... |
| Illinois | bbl. | 2.27 – | ..... |
| Indiana | bbl. | 2.28 – | ..... |
| Kansas and Oklahoma, 28 deg. | bbl. | 1.40 – | ..... |
| California, 35 deg. and up | bbl. | 1.04 – | ..... |

## Gasoline, Etc.

| | | | |
|---|---|---|---|
| Motor gasoline, steel bbls | gal. | $0.23½ – | ..... |
| Naphtha, V. M. & P. devd, steel bbls | gal | .22½ – | ..... |
| Kerosene, ref. tank wagon | gal. | .14 – | ..... |
| Bulk, W. W. export | gal. | .07½ – | ..... |
| Lubricating oils: | | | |
| Cylinder, Penn., dark | gal. | .27 – | .30 |
| Bloomless, 30@31 grav | gal. | .20 – | .22 |
| Paraffin, pale | gal. | .24 – | .25 |
| Spindle, 200, pale | gal. | .25 – | .26 |
| Petrolatum, amber, bbls | lb. | .05 – | .05½ |
| Paraffine wax (see waxes) | | | |

## Refractories

| | | |
|---|---|---|
| Bauxite brick, 56% $Al_2O_3$, f.o.b. Pittsburgh | ton | $45–50 |
| Chrome brick, f.o.b. Eastern shipping points | ton | 50–52 |
| Chrome cement, 40-50% $Cr_2O_3$ | ton | 23–27 |
| 40-45% $Cr_2O_3$, sacks, f.o.b. Eastern shipping points | ton | 23.00 |
| Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks | 1,000 | 40–46 |
| 2nd. quality, 9-in. shapes, f.o.b. wks | 1,000 | 36–41 |
| Magnesite brick, 9-in. straight (f.o.b. wks.) | ton | 65–68 |
| 9-in. arches, wedges and keys | ton | 80–85 |
| Scraps and splits | ton | 85 |
| Silica brick, 9-in. sizes, f.o.b. Chicago district | 1,000 | 48–50 |
| Silica brick, 9-in. sizes, f.o.b. Birmingham district | 1,000 | 48–50 |
| F.o.b. Mt. Union, Pa | 1,000 | 42–44 |
| Silicon carbide refract. brick, 9-in. | 1,000 | 1,100.00 |

## Ferro-Alloys

| | | | |
|---|---|---|---|
| Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y. ton | | $200.00 – | $225.00 |
| Ferrochromium, per lb. of Cr, 6-8% C | lb. | .11½ – | .11¾ |
| 4-6% C | lb. | .12 – | .13 |
| Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid | gr. ton | 120.00 – | ..... |
| Spiegeleisen, 19-21% Mn | gr. ton | 40.00 – | ..... |
| Ferromolybdenum, 50-60% Mo, per lb Mo | lb. | 1.90 – | 2.15 |
| Ferrosilicon, 10-15% | gr. ton | 38.00 – | 40.00 |
| 50% | gr. ton | 86.00 – | 89.00 |
| 75% | gr. ton | 150.00 – | 160.00 |

| | | | |
|---|---|---|---|
| Ferrotungsten, 70-80%, per lb. of W | lb. | $0.85 - | $0.90 |
| Ferro-uranium, 35-50% of U. per lb. of U | lb. | 6.00 - | ..... |
| Ferrovanadium, 30-40%, per lb. of V | lb. | 3.75 - | 4 00 |

## Ores and Semi-finished Products

| | | | |
|---|---|---|---|
| Bauxite, dom. crushed, dried, f.o.b. shipping points | ton | $6.50 - | $8.75 |
| Chrome ore Calif. concentrates, 50% min. $Cr_2O_3$ | ton | 22.00 - | 23.00 |
| C.i.f. Atlantic seaboard | ton | 21.00 - | 24.00 |
| Coke, fdry., f.o.b. ovens | ton | 7.00 - | 7 50 |
| Coke, furnace, f.o.b. ovens | ton | 6.00 - | 6 50 |
| Fluorspar, gravel, f.o.b. mines' Illinois | ton | 19.00 - | 21 00 |
| Ilmenite, 52% $TiO_2$ | lb. | .01½ - | .01¾ |
| Manganese ore, 50% Mn, c.i.f. Atlantic seaport | unit | .33 - | ..... |
| Manganese ore, chemical ($MnO_2$) | ton | 75.00 - | 80 00 |
| Molybdenite, 85% $MoS_2$, per lb. $MoS_2$, N. Y. | lb. | .65 - | .70 |
| Monazite, per unit of $ThO_2$, c.i.f., Atl. seaport | lb. | .06 - | 08 |
| Pyrites, Span., fines, c.i.f. Atl. seaport | unit | .11½ - | 12 |
| Pyrites, Span., furnace size, c.i.f. Atl. seaport | unit | .11½ - | .12 |
| Pyrites, dom. fines, f.o.b. mines, Ga. | unit | .12 | |
| Rutile, 95% $TiO_2$ | lb. | .12 - | ..... |
| Tungsten, scheelite, 60% $WO_3$ and over, per unit $WO_3$ | unit | 8.50 - | 8.75 |
| Tungsten, wolframite, 60% $WO_3$ and over, per unit $WO_3$ | unit | 8.00 - | 8.25 |
| Uranium ore (carnotite) per lb. of $U_3O_8$ | lb. | 3.50 - | 3 75 |
| Uranium oxide, 96% per lb. $U_3O_8$ | lb. | 2.25 - | 2 50 |
| Vanadium pentoxide, 99% | lb. | 12.00 - | 14 00 |
| Vanadium ore, per lb. $V_2O_5$ | lb. | 1.00 - | ..... |
| Zircon, washed, iron free, f.o.b. Pablo, Fla. | lb. | .04½ - | 13 |

## Non-Ferrous Materials

| | Cents per Lb |
|---|---|
| Copper, electrolytic | 16½-16¾ |
| Aluminum, 98 to 99% | 23-24 |
| Antimony, wholesale, Chinese and Japanese | 8 - 8½ |
| Nickel, virgin metal | 28-30 |
| Nickel, ingot and shot | 30- |
| Monel metal, shot and blocks | 32.00 |
| Monel metal, ingots | 38.00 |
| Monel metal, sheet bars | 45 00 |
| Tin, 5-ton lots, Straits | 44 50 |
| Lead, New York, spot | 8 00 |
| Lead, E. St. Louis, spot | 7.75 |
| Zinc, spot, New York | 7.35 |
| Zinc, spot, E. St. Louis | 7.00 |

## Other Metals

| | | |
|---|---|---|
| Silver (commercial) | oz. | $0.67½ |
| Cadmium | lb. | 1.00 |
| Bismuth (500 lb. lots) | lb. | 2.55 |
| Cobalt | lb. | 2.65@2.85 |
| Magnesium, ingots, 99% | lb. | 1.25- |
| Platinum | oz. | 115.00 |
| Iridium | oz. | 260.00@275.00 |
| Palladium | oz. | 79.00 |
| Mercury | 75 lb. | 69.00- |

## Finished Metal Products

| | Warehouse Price Cents per Lb |
|---|---|
| Copper sheets, hot rolled | 25.50 |
| Copper bottoms | 30.75 |
| Copper rods | 25.25 |
| High brass wire | 19.50 |
| High brass rods | 17.00 |
| Low brass wire | 21.10 |
| Low brass rods | 22.00 |
| Brazed brass tubing | 24.25 |
| Brazed bronze tubing | 29.00 |
| Seamless copper tubing | 25.25 |
| Seamless high brass tubing | 23.50 |

**OLD METALS**—The following are the dealers' purchasing prices in cents per pound:

| | |
|---|---|
| Copper, heavy and crucible | 11.30@11.50 |
| Copper, heavy and wire | 11.25@11.50 |
| Copper, light and bottoms | 9.25@ 9.50 |
| Lead, heavy | 5.75@ 6.00 |
| Lead, tea | 3.50@ 3.75 |
| Brass, heavy | 6.25@ 6.40 |
| Brass, light | 5.35@ 5.75 |
| No. 1 yellow brass turnings | 6.30@ 6.50 |
| Zinc | 3.50@ 4.00 |

## Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

| | New York | Chicago |
|---|---|---|
| Structural shapes | $3.29 | $3.14 |
| Soft steel bars | 3.19 | 3.04 |
| Soft steel bar shapes | 3.19 | 3.04 |
| Soft steel bands | 3.29 | 3.19 |
| Plates, ¼ to 1 in. thick | 3.29 | 3.14 |

# Industrial

Financial, Construction and Manufacturing News

# Construction and Operation

## Alabama

PELHAM—The Superior Lime & Hydrate Co., recently organized, will immediately commence construction of a new plant on local site just acquired, to be equipped for a capacity of about 15,000 bbl. of hydrated lime per month. It is estimated to cost close to $70,000, with machinery. The company is headed by H. G. Bridgewater and W. D. Lewis, Jr., P. O. Box 2311, Birmingham, Ala.

## Arizona

WINKLEMAN—The Arizona Portland Cement Co., Phœnix, has acquired a tract of about 16 acres of land near Winkelman, and plans the construction of a new cement mill. It will consist of a number of buildings with power house, estimated to cost approximately $1,000,000, with machinery. Loren C. Barton, Corporation Bldg., Los Angeles, is assistant general manager, in charge.

## California

SAN DIEGO—The Vitrified Products Corp. will commence the construction of a main 2-story building, 80x120 ft., for its proposed new plant in the Old Town district, to be equipped for the manufacture of vitrified sewer pipe and kindred hollowware. The installation will include a complete grinding and screening department; molding room; firing department and power house. The plant will cost $175,000 with machinery. Victor Kramer is president; and George W. Kummer, secretary and general manager.

LOS ANGELES—The California Cyanide Co., recently organized, has acquired property at Cudahy City, near Los Angeles, for the construction of its proposed plant, and purposes to break ground for the initial buildings at an early date. It will cost in excess of $500,000, with machinery. The company is headed by F. W. Braun, president, the Braun Corporation, 363 New High St. The Air Reduction Sales Co., 342 Madison Ave., New York, is also interested in the new organization.

## Florida

KELSEY CITY—The Royal Palm Rubber Co., West Palm Beach, lately formed with a capital of $100,000, has acquired property on the Dixie Highway, and will have plans drawn at once for a new plant, to cost approximately $55,000, with machinery. William Manly King, West Palm Beach, is architect. C. F. Laughlin is president; and Gordon Ware, West Palm Beach, secretary.

LAKELAND—The Non-Acid Fertilizer & Chemical Co. will hold in abeyance the construction of its proposed plant in the vicinity of Jacksonville, recently announced.

## Georgia

AINSLIE—The Southern Portland Cement Co., Macon, Ga., recently organized under Delaware laws with capital of $6,000,000, will break ground in 60 days for its proposed new cement mill on local site, comprising a tract of 30 acres lately purchased. The plant will consist of a number of buildings, estimated to cost close to $1,000,000, with equipment. A power plant will be constructed. W. Jordan Masse, head of the Bibb Brick Co., Macon, is president.

## Kansas

ANTHONY—The Anthony Salt Works, Inc., is perfecting plans for the rebuilding of its local plant, recently destroyed by fire with loss estimated at $250,000, including buildings and machinery. The new works will include a power house, and is estimated to cost a like amount.

## Louisiana

SHREVEPORT—The Red River Refining Co. has preliminary plans under way for the construction of a new refining plant, estimated to cost about $500,000. A department will be established for the production of lubricating oils. The company has recently increased its capital from $1,000,000 to $3,000,000, for general expansion.

LOREAUVILLE—The local refinery of the Vida Sugar Refining Co., Iberia parish, has been acquired by new interests headed by John O. Bonin and John E. Schwing. It is purposed to organize a company to operate the plant and plans are in progress for additions and improvements including the installation of machinery for increased output.

NEW ORLEANS—The American Tar & Turpentine Co., Broad St., will soon take bids on a general contract for the rebuilding of the portion of its plant, recently destroyed by fire with loss estimated at close to $100,000, with machinery. The new structure will cost approximately a like amount.

## Maine

RUMFORD—The Oxford Paper Co. has plans for the installation of additional equipment at its plant for considerable increase in production estimated to cost approximately $250,000.

## Massachusetts

HOLYOKE—The Chemical Paper Co. will make improvements at its plant to cost about $22,000.

FALL RIVER—The E. S. Parks Shellac Co., 844 South Main St., has awarded a contract to Joseph M. Darling, Jr., 41 North Main St., for the erection of a 1-story addition, 50x100 ft., estimated to cost about $20,000.

## Michigan

GRAND HAVEN—G. E. Burt, Muskegon, Mich., is organizing a new company to establish a local plant for the manufacture of a recently perfected processed product, similar to celluloid, to be known as kyloid. Plans for the works will be ready at an early date.

IONIA—The Michigan Porcelain Tile Works, Inc., has authorized plans for enlargements in its plant to include the installation of additional equipment. The company has recently increased its capital from $100,000 to $150,000, for expansion. R. A. Hawley is president; and Harvey E. Kidder, secretary and treasurer.

## Mississippi

MOSS POINT—The Southern Paper Co. has broken ground for the construction of a new plant unit to cost in excess of $1,000,000 with machinery. It is purposed to more than double the present output.

## Missouri

SPRINGFIELD—The Kream Olive Soap Co. has completed plans for the construction of a new plant on Glenstone Rd., comprising two 2-story structures, 40x110 ft. and 40x75 ft. respectively. Both buildings will be used for soap manufacture.

NEVADA—The National Asphalt Refining Co., recently organized with a capital of $1,500,000, has plans in progress for the construction of a new refining plant, on local site, estimated to cost approximately $400,000, with equipment.

ELSBERRY—The Crystal Carbonate Lime Co. has tentative plans for the rebuilding of the portion of its plant, recently destroyed by fire with loss estimated at about $65,000, including equipment.

## New Jersey

NEWARK—The Eberhard Faber Rubber Co., 202-14 New St., has awarded a contract to Edward M. Waldron, Inc., 27 Central Ave., for the construction of an addition to its 4-story plant, 60x105 ft., estimated to cost $80,000.

ELIZABETH—The Standard Oil Co. of New Jersey, 26 Broadway, New York, has plans in preparation for the construction of a new oil-treating and filtering plant at its Bayway refinery, estimated to cost $300,000, with equipment. J. R. Carringer is superintendent.

NEWARK—The Capston Mfg. Co., 132 Union St., has acquired the factory on Plum Point Lane, formerly occupied by the Gulf Refining Co., consisting of a number of buildings, for the establishment of a new plant for the manufacture of oils greases, soaps, etc. The structures will be remodeled and machinery installed at once.

TRENTON—The State Highway Commission will have plans prepared in the near future for the construction of a state-operated cement manufacturing plant, as provided in a recent legislative bill, approved by Governor Silzer. An appropriation will be arranged.

### New York

LONG ISLAND CITY—The Patterson-Sargent Co., Wason and Hamilton Sts., Cleveland, O., manufacturer of paints, varnishes, etc., has awarded a contract to the Guarantee Construction Co., 140 Cedar St. New York, for a 4-story and basement addition, 60x135 ft., at its plant on Hunters Point Ave., estimated to cost $500,000.

CORNING—The Roulette Glass Co., recently organized with a capital of $3,000,000, is reported to have plans in progress for the construction of a new plant for the manufacture of bottles and other hollowware. Dr. G. S. Goff is president; and Thomas F. Rogers, secretary, both of Corning.

BUFFALO—Pratt & Lambert, Inc., 79 Tonawanda St., manufacturer of varnishes, oils, etc., has filed plans for the erection of three 2-story additions to its plant, to cost about $40,000.

BROOKLYN—A. Werbelovsky, 83 Meserole St., manufacturer of glass products, has completed plans for a new 2-story factory, 54x100 ft., at 57-59 Scholes St., estimated to cost $50,000.

### Ohio

TOLEDO—The Ajax Rubber Co., Inc., Breunig Ave., Trenton, N. J., is planning for the erection of a new plant on local property recently acquired, estimated to cost in excess of $200,000, with machinery. Horace De Lisser is chairman of the board.

### Oklahoma

DELAWARE—The Henderson Gasoline Co., is planning for the rebuilding of the portion of its refining plant, destroyed by fire, April 10, with loss estimated at $50,000, including equipment.

### Pennsylvania

WILLIAMSPORT—The Keystone Glue Co. will make extensions and improvements in its plant, including the construction of a new power plant, estimated to cost about $200,000, with machinery.

EDGELY—The first unit of the new local mill of the Megargee Paper Co., Modena, Pa., will consist of a 3-story structure, 112x180 ft.; two 2-story buildings, 180x220 ft. and 75x200 ft. respectively; and a number of 1-story structures and power plant, the latter to have a capacity of 4,000 kw. As soon as this unit is completed, expected by the close of the year, work will be commenced on a second unit of approximately like size. The plant will cost in excess of $500,000, with machinery.

### South Carolina

SPARTANBURG—The Farmers' Fertilizer Works has tentative plans under consideration for the rebuilding of the portion of its plant, recently destroyed by fire with loss estimated at about $25,000, including equipment.

### Texas

TEXAS CITY—The Texas Sugar Refining Co., recently organized, has awarded a general contract to John Monks & Sons, 438 Broadway, New York engineers, for the erection of the first unit of its new refinery on local site, to be equipped for a capacity of 500 tons per annum. It will cost in excess of $600,000.

BROWNWOOD—The Helfous Gasoline Co., Dallas, Tex., has commenced the erection of a new gasoline-refining plant on local site, estimated to cost close to $250,000, with machinery.

BRECKENRIDGE—The Texas Carbon Industries, Inc., recently organized, has commissioned C. K. Springfield, engineer, Austin Street Railroad Co., Austin, Tex., to prepare plans for the construction of a new plant on local site for the manufacture of carbon black, estimated to cost about $175,000, with machinery. Bert Blair, Mexia, Tex., is president.

ELECTRA—The Texhoma Oil & Refining Co. has commenced the construction of a new local casinghead gasoline plant, to be equipped to handle 1,500 bbl. of oil per day. It will cost about $75,000. The initial unit will be enlarged at a later date.

### Virginia

NORFOLK—The Norfolk Sugar Refining Co., recently formed with a capital of $3,500,000, is selecting a site on the waterfront for a new refining plant, estimated to cost in excess of $1,000,000, with machinery. Plans will be completed for the first unit at an early date. J. B. Morgan, Southern Produce Bldg., and R. B. Tucker, 112 Brooke Ave., head the new organization.

## New Companies

PEERLESS CHEMICAL CO., INC., Richmond, Va.; chemicals and chemical byproducts; $20,000. Ernest W. Farley, president; and Thomas J. Starke, secretary, both of Richmond.

KLOR-X CHEMICAL CORP., Buffalo, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: J. M. and D. I. Chernaik, and F. J. O'Neill. Representative: Moore & Killian, Gluck Bldg., Niagara Falls, N. Y.

COLONIAL INSECTECIDE CO., Boston, Mass.; chemicals and insecticides; $5,000. Frederick S. Gore, president; and A. M. Cape, Allston, Mass., treasurer and representative.

STANDARD ABRASIVE CO., Jersey City, N. J.; abrasive products, grinding materials, etc.; $25,000. Incorporators: Marshall Van Winkle, Jr., Herman A. Ahlers, Jr., and Benjamin L. Drapeau, 449 Pacific Ave., Jersey City.

ROULETTE GLASS CO., Dover, Del.; glass products; $3,200,000. Representative: Capital Trust Co. of Delaware, Dover, Del.

MISKO REFINERIES, INC., Laredo, Tex.; construct and operate oil-refining plants; $200,000. Incorporators: O. W. Killam, S. P. Coblentz and W. T. Killam, all of Laredo.

GLOBE GASOLINE CO., Glasgow, Ky.; construct and operate oil and gasoline refineries; $200,000. Incorporators: W. J. Oliver, Robert Carlye and L. W. Jones, all of Glasgow.

NORTH SHORE FIBRE CO., INC., Lynn, Mass.; fiber products; $10,000. John J. Sullivan, president; and George P. Batchelder, 116 Euclid Ave., Lynn, treasurer and representative.

EUKOL CHEMICAL CO., INC., New York, N. Y.; chemicals and chemical byproducts; $250,000. Incorporators: C. McBride, F. Katz and J. Polansky. Representative: N. L. Goldstein, 30 Church St., New York.

SPRINGFIELD LEATHER PRODUCTS CO., Springfield, O.; operate a leather tannery; $120,000. Incorporators: John M. Cole and Lee Bayley, both of Springfield.

TRI-ME LABORATORIES, INC., Indianapolis, Ind.; chemicals and chemical byproducts; $50,000. Incorporators: Walter J. Le Saulnier, Russell V. Duncan and A. S. Burdick, all of Indianapolis.

WALTHAM PAPER MILL, INC., Waltham, Mass., paper products; $50,000. Harold A. Allen, president and treasurer; and R. W Allen, secretary, both of Waltham.

NORFOLK TALLOW CO., INC., Norfolk, Va.; soaps, greases, etc.; $25,000. E. L. Field, president; and J. W. Field, secretary, both of Norfolk.

LINDEMANN LABORATORY, INC., Wallington, N. J.; chemicals and chemical byproducts; 2,000 shares of stock, no par value. Incorporators: John W. Heffin, E. Maurice Thyvaert and Otto Lindemann, 25 Kossuth St., Wallington.

APEX RUBBER PRODUCTS CO., Akron, O.; rubber goods; $25,000. Incorporators: N. O. Mather and Lloyd A. Fasett, both of Akron.

ACCO OIL CO., Tulsa, Okla.; refined petroleum products; $50,000. Incorporators: C. L. and C. C. Anderson, Tulsa; and Y. R. Brooks, Okmulgee, Okla.

TOWER GASOLINE & REFINING CO., Wilmington, Del.; refined petroleum and byproducts; $1,000,000. Representative: Corporation Service Co., Equitable Bldg., Wilmington.

LEA MFG. CO., Waterbury, Conn.; lacquers, electroplating materials, etc.; $50,000. Incorporators: R. S. Leather, F. W. Carroll and John F. Barry, 91 Waterville St., Waterbury.

KIDWELL & BASCOM, INC., New York, N. Y.; chemicals; $14,000. Incorporators: P. H. Bascom, C. H. Kidwell and R. F. Bacon. Representative: P. D. Reed, 50 Union Sq., New York.

GREAT LAKES REFINING CO., Detroit, Mich.; 200,000 shares of stock, no par value; refined petroleum products. Incorporators: J. P. Shillaber, W. Leslie Miller and William H. Granse, 901 Blaine Ave., Detroit.

MURAL CO, INC., New Brighton, S. I.; paints, oils, varnishes, etc.; $50,000. Incorporators: J. A., E. D. and A. P. King. Representative: Richard Kelly, 233 Broadway, New York.

SOUTHWESTERN OIL CORP., Dover, Del.; refined petroleum products; $1,000,000. Representative: Arley M. Magee, Dover.

NESTLER PRODUCTS CORP., New York, N. Y.; rubber products; $10,000. Incorporators: J. C. Kimball and B. Cahn. Representative: J. Blumenthal, 1475 Broadway, New York.

## Industrial Finances

TUCKER CHEMICAL MFG. CO., INC., Paducah, Ky., increased capital from $25,000 to $75,000, for expansion.

HARRITON GLUE CO., 71 Greene St., New York, N. Y., increased capital to $25,000, for increased operations.

SUNSET PETROLEUM CO., Houston, Tex., increased capital from $30,000 to $100,000, for general expansion.

CHELSEA FIBRE MILLS, INC., 212 5th Ave., New York, N. Y., reduced capital from $2,600,000 to $2,000,000.

GILLILAND OIL CO., 111 Broadway, New York, N. Y., reorganized, is arranging for a bond issue of $10,000,000, of which $5,400,000 will be used for extensions and improvements in plants and for the purchase of additional properties. P. J. Hurley is president and general manager.

EMERALD PETROLEUM CO., Washington, Pa., increased capital from $500,000 to $1,000,000 for expansion.

STANDARD SOAP CO., Emeryville, Calif., increased capital from $500,000 to $1,000,000, for extensions in plant and business.

## Foreign Trade Opportunities

*Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.*

COTTONSEED CAKES in whole cargoes or large parcels. Copenhagen, Denmark. Agency.—6087.

CRUSHING AND PULVERIZING PLANT for the manufacture of lime, of a capacity of 2 to 5 tons per day—San Jose, Costa Rica. Purchase. Quotations, c.i.f. Puntarenas or Limon. Terms: Payment against documents.—6136.

MANGANESE ORE in quantity of 60,000 tons annually. Paris, France. Purchase. Quotations, c.i.f. French port. Correspondence, French.—6150.

ASPHALT—Good grade of asphalt for street paving. Santos, Brazil. Purchase and agency. Quotations, c.i.f. Brazilian port. Correspondence, Portuguese or French.—6153.

CYANIDES OF SODA AND POTASH. Rhodesia, South Africa. Agency. Quotations, c.i.f. Portuguese East Africa.—6162.

ROSIN AND TURPENTINE. Mannheim, Germany. Agency. Quotations, c.i.f. Rhineport or Rotterdam. Terms: Cash upon receipt of shipment.—6163.

CHEMICALS, pharmaceutical products, and toilet preparations. Rio de Janeiro, Brazil. Agency.—6164.

ALUMINUM AND LEAD, 99 per cent pure, in pigs or bars for foundry work; muriatic acid in drums; and sheet iron in all sizes and thicknesses. Sao Paulo, Brazil. Purchase. Quotations, c.i.f. Santos.—6165.

TURPENTINE of medium and best quality, in shipments of from 50 to 100 bbl. Rotterdam, Netherlands. Purchase or agency. Quotations, c.i.f. Netherlands port. Terms: Cash against documents.—6166.

SPRAYING MATERIALS for the various fruits grown in South Africa. Johannesburg, South Africa. Agency and purchase. Quotations, f.o.b. New York.—6167.

PERFUMERY AND TOILET PREPARATIONS, drugs and chemicals, fancy goods, electrical appliances, automobile accessories and specialties, and tools of these trades. Melbourne, Australia. Agency. Terms: Cash against documents.—6168.